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Federal Department of the Environment,
Transport, Energy and Communications

Federal Office of Transport

RAILWAY BASE TUNNEL PROJECTS IN SWITZERLAND



**Dr. Rudolf Sperlich
Swiss Federal Office of Transport
Zaragoza, October 31th 2008**



Introduction

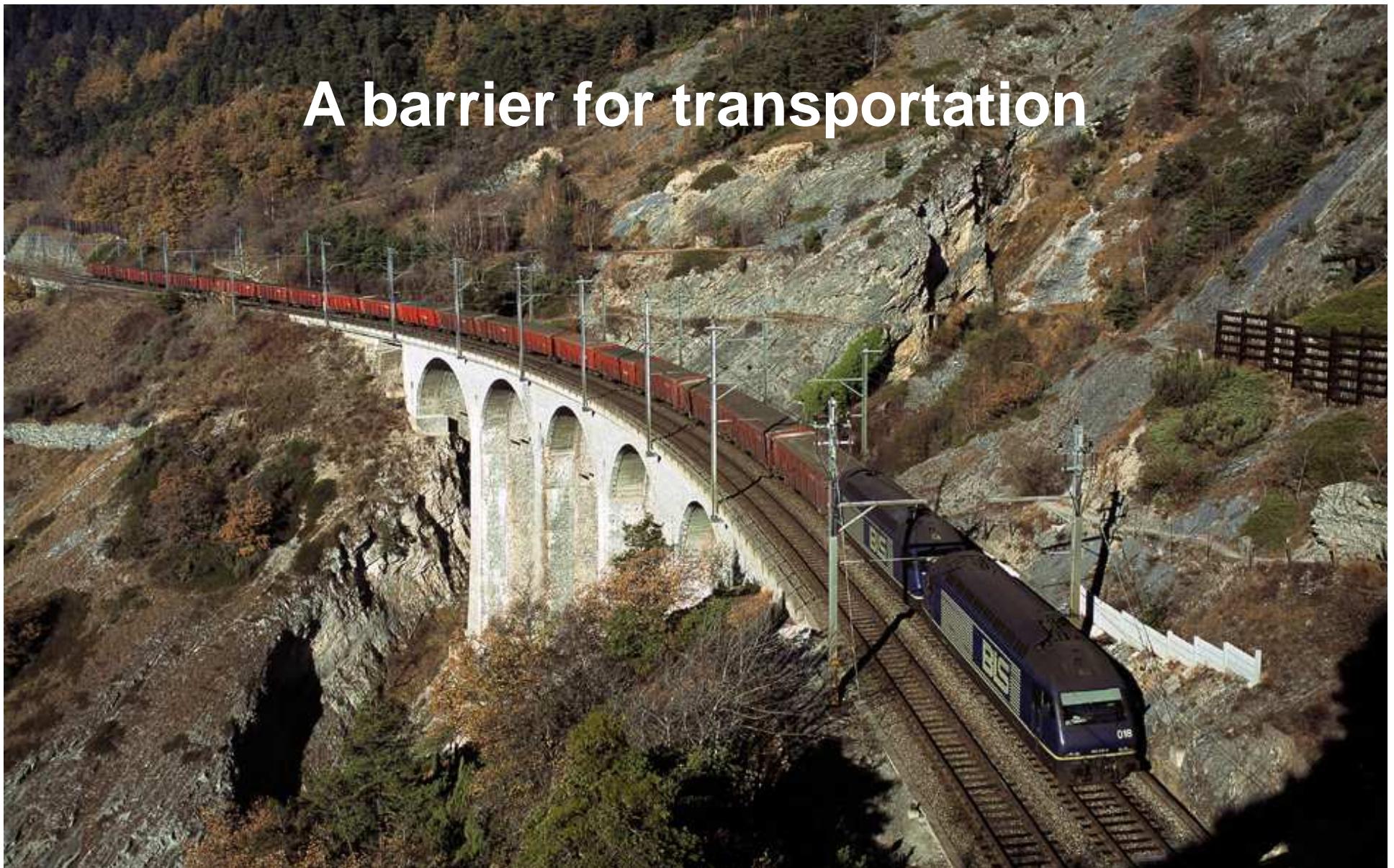
- Traffic policy CH
- Financing:
Public transport fund
- Most important project:
New Rail Link through the Alps (NRLA)
- Supervision
- Conclusions





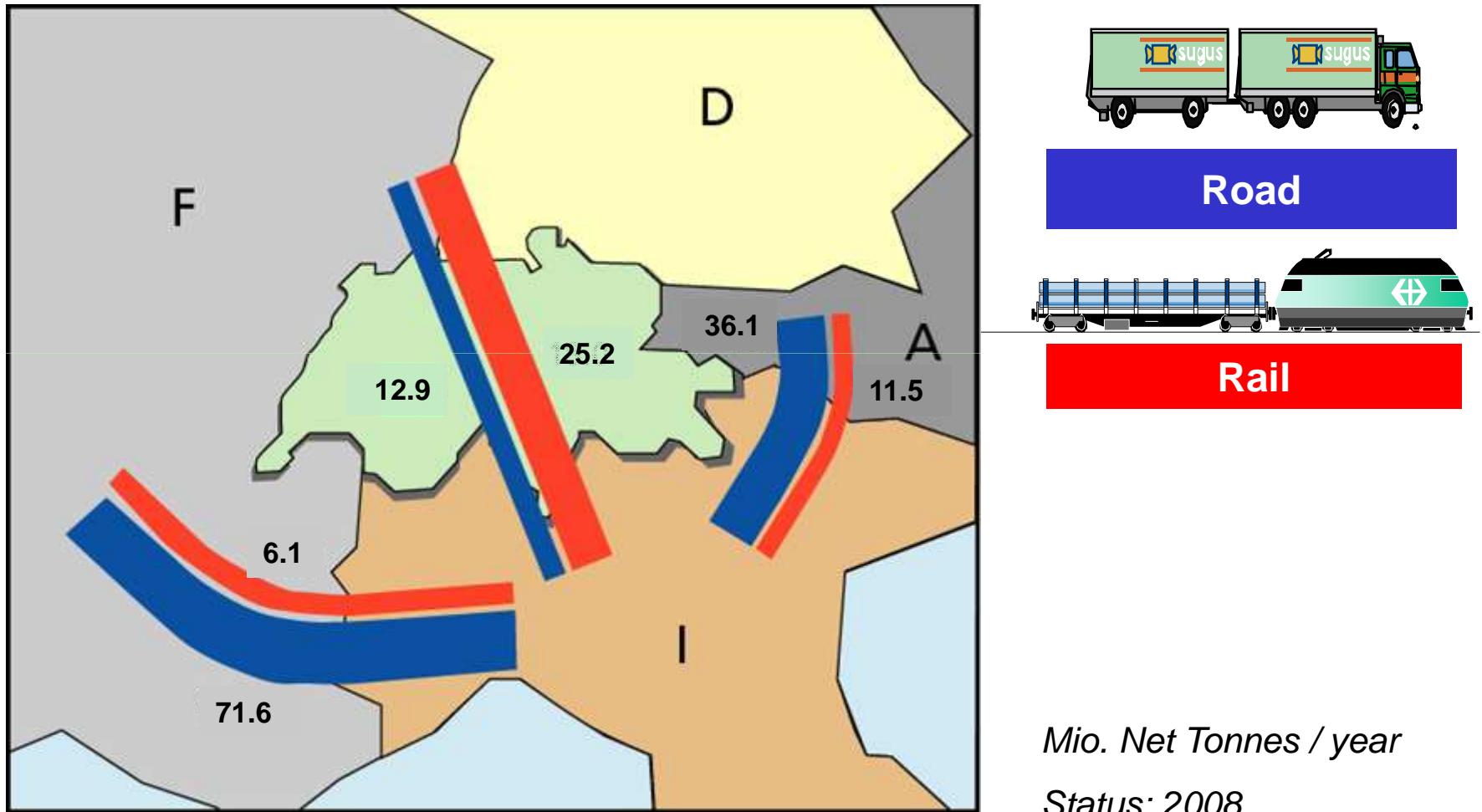
The Alps

A barrier for transportation



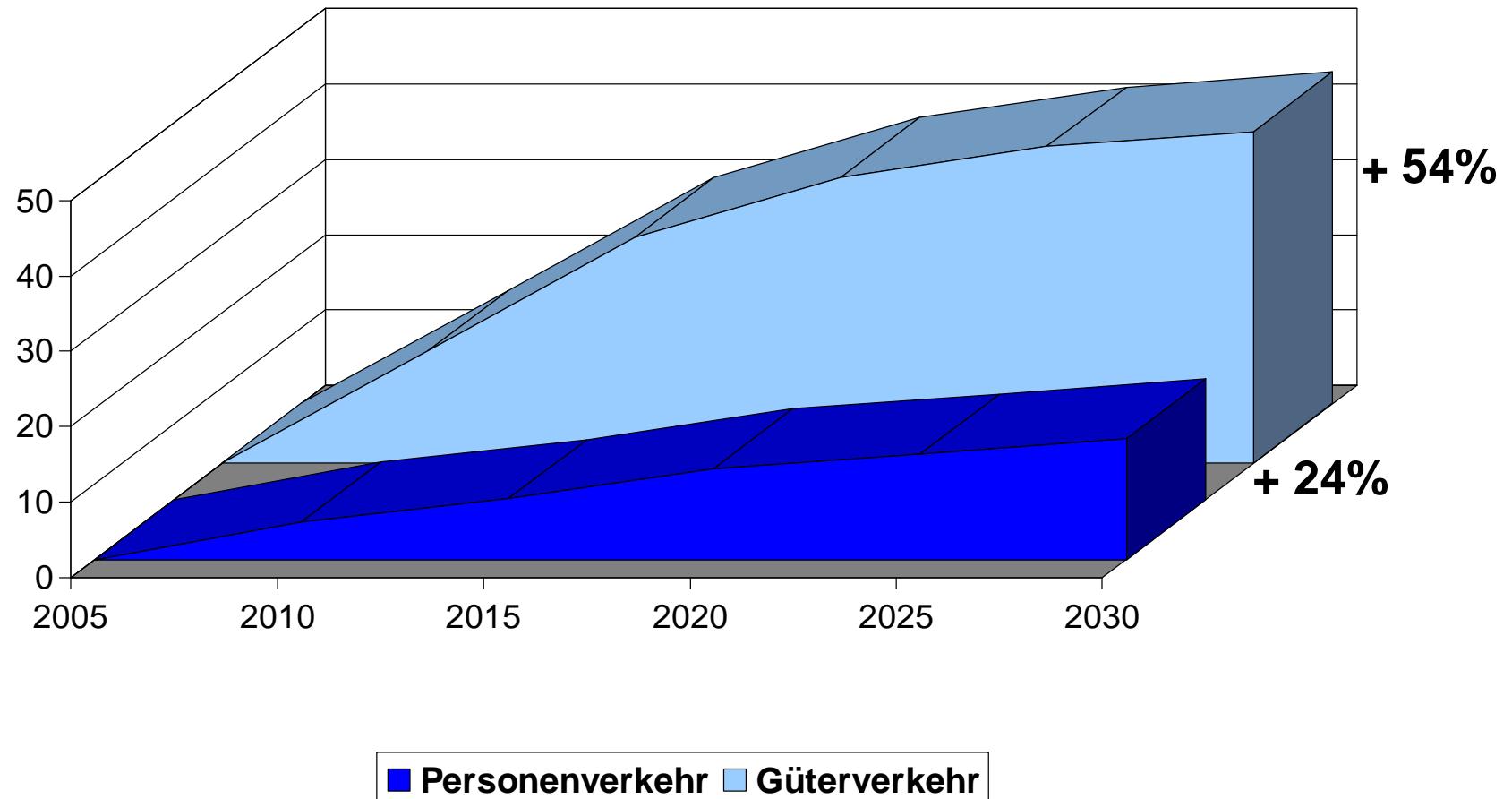


Transalpine Swiss freight traffic: subdivision and modal split



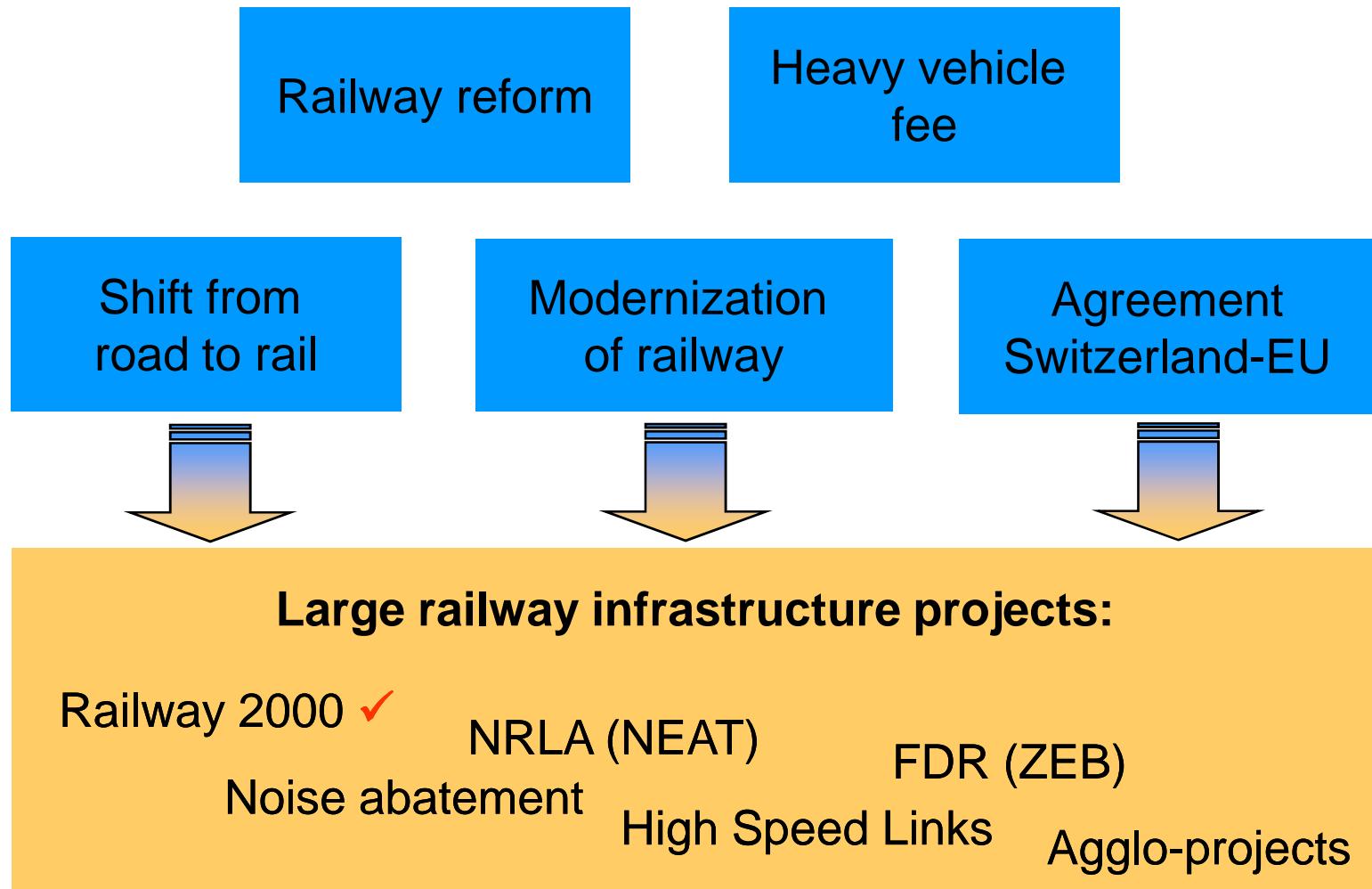


Swiss Traffic evolution until 2030



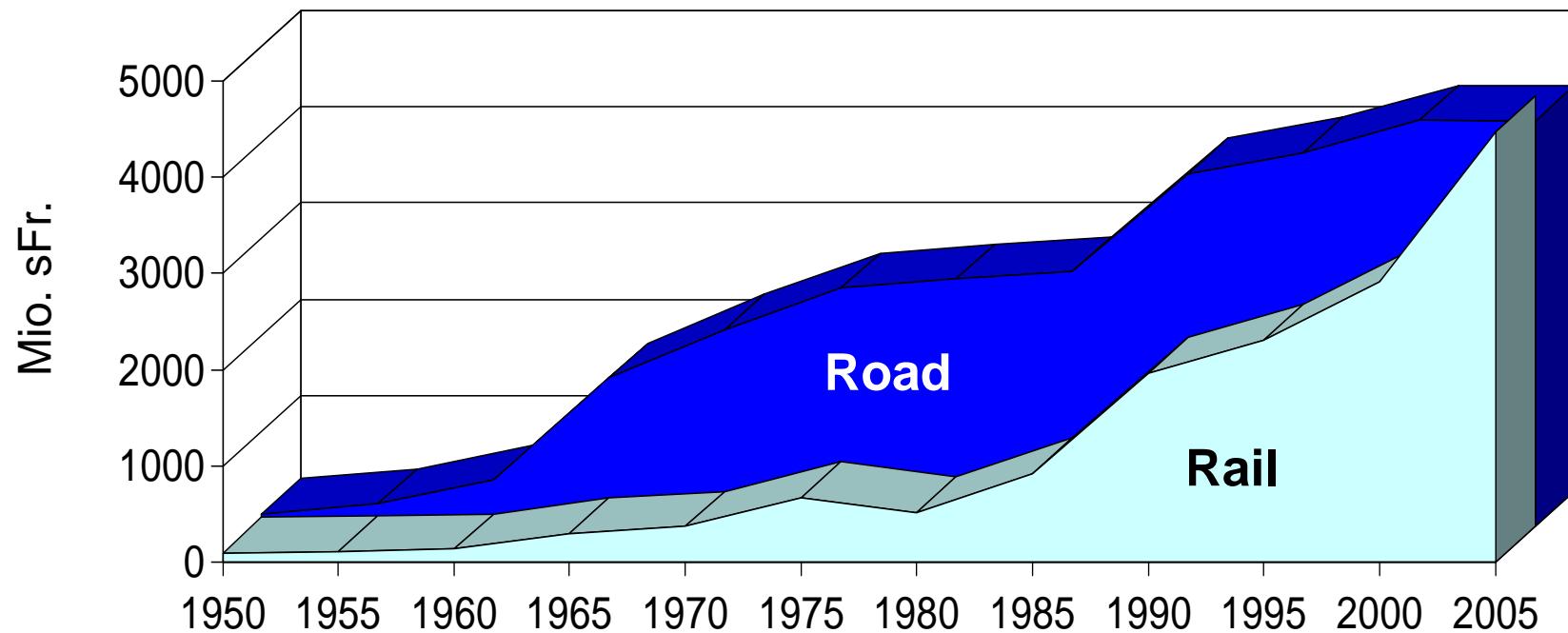


Elements of the Swiss transport policy



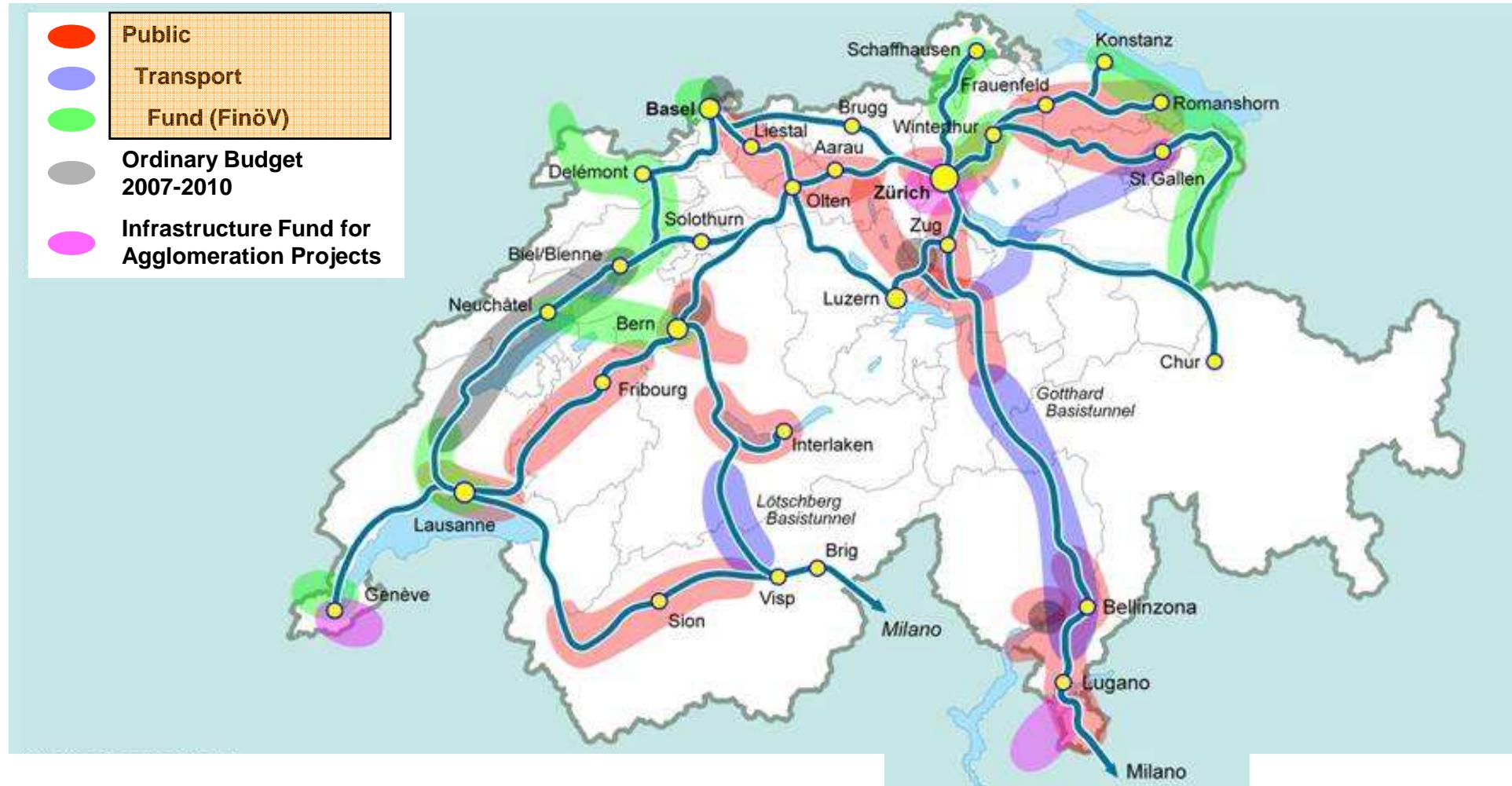


Expenses for infrastructure





Improvement of the railway network (large-scale projects until 2030)





New Railway link through the Alps: The first voting

Information
booklet 1992

Was ist die NEAT?

Elemente des Konzeptes:

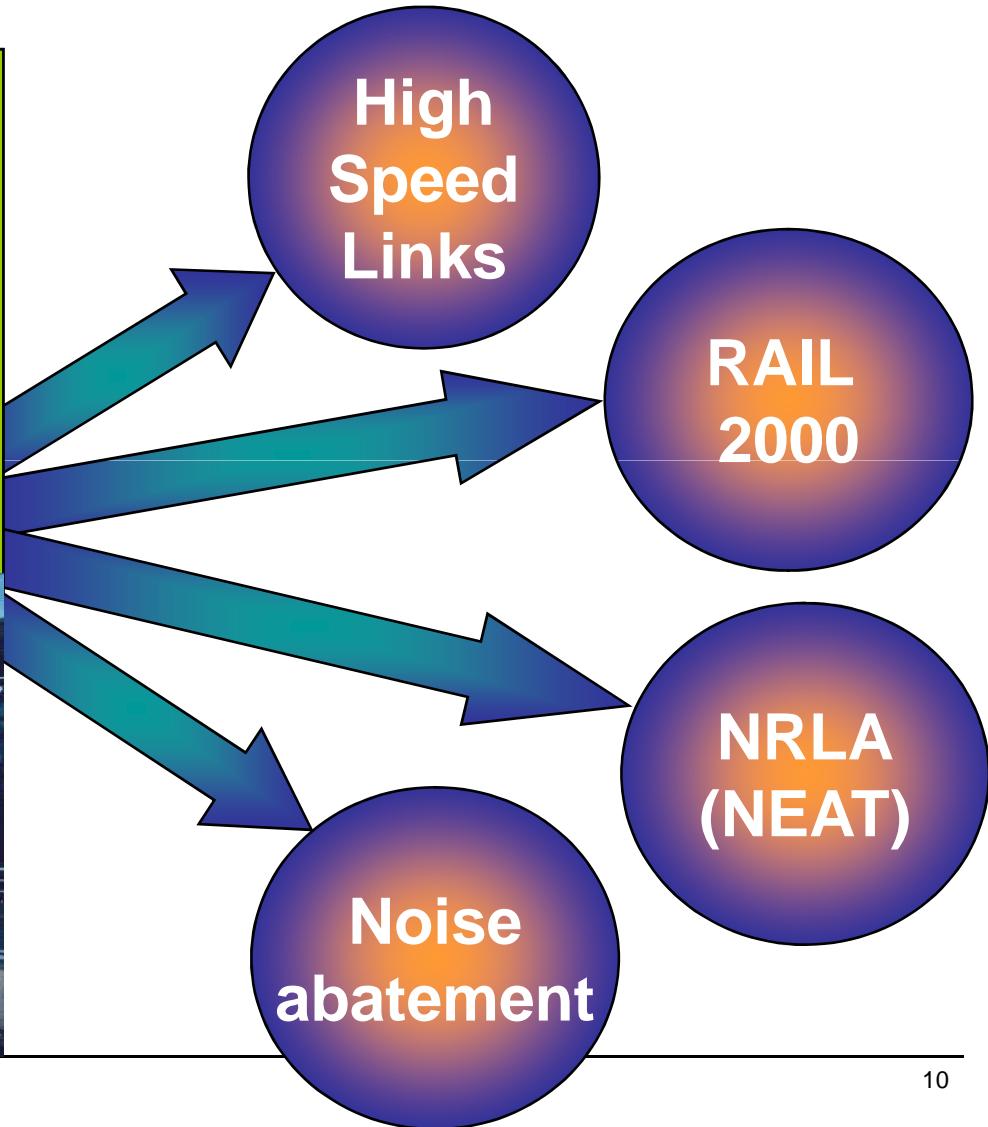
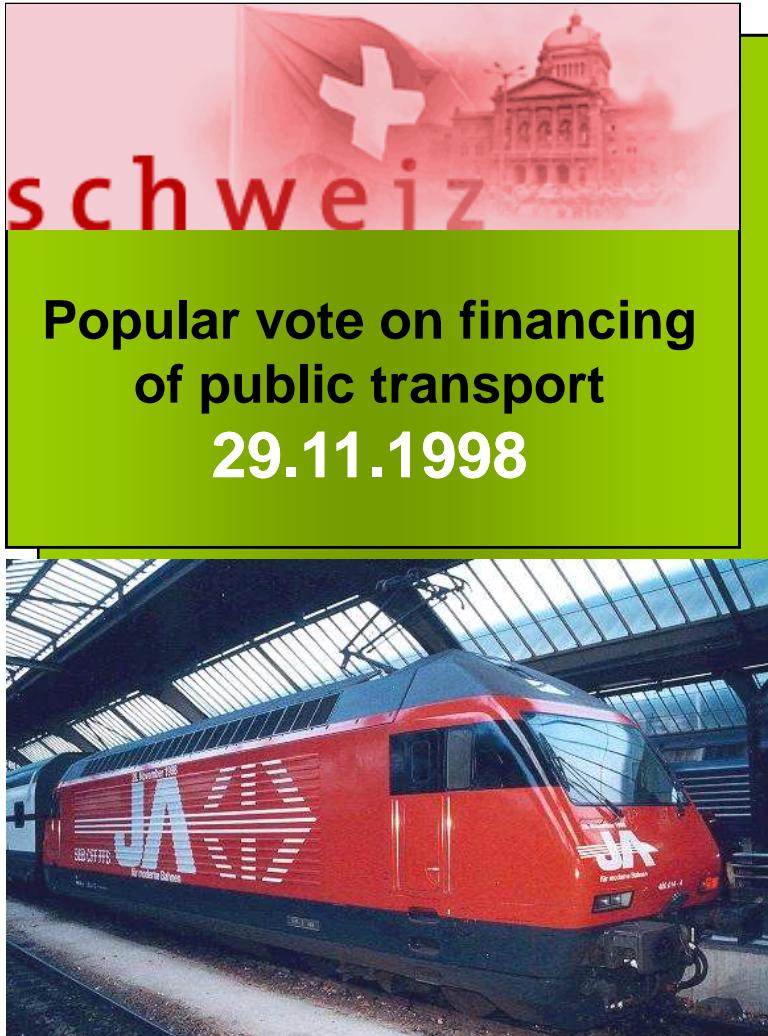
- Transversal: Neubaustrecken Gotthard / Lötschberg
- Zufahrtslinien
- Einbezug der Westschweiz
- Einbezug der Ostschweiz

Zum Vorhaben der neuen schweizerischen Eisenbahn-Alpentransversale (NEAT) gehören vier Elemente:

- Die Neubaustrecke Arth-Goldau-Lugano mit Basistunneln am Gotthard (ca. 50 km) und am Monte Ceneri (12,6 km).
- Die Basislinie aus dem Raum Frutigen ins Rhonetal (ca. 30 km). Sie verbindet zudem zwei Nationalstrassen, indem sie auch dem Autoverlad dient.
- Der engere Anschluss der Westschweiz an das europäische Schienennetz. Die Schweiz wird über Genf und Basel erschlossen, und die dazwischen liegenden Verbindungen im Jura werden verbessert.
- Der Einbezug der Ostschweiz durch den Bau neuer Linien aus dem Raum Zug in den Raum Zürichsee. Darüberhinaus werden die Zufahrten von St. Gallen in den Raum Zürichsee verbessert und der Bahnhof Chur ausgebaut. In Sedrun (Surselva) ist zur Erschließung der Baustelle ein Schacht mit verbesserten Zufahrten vorgesehen.

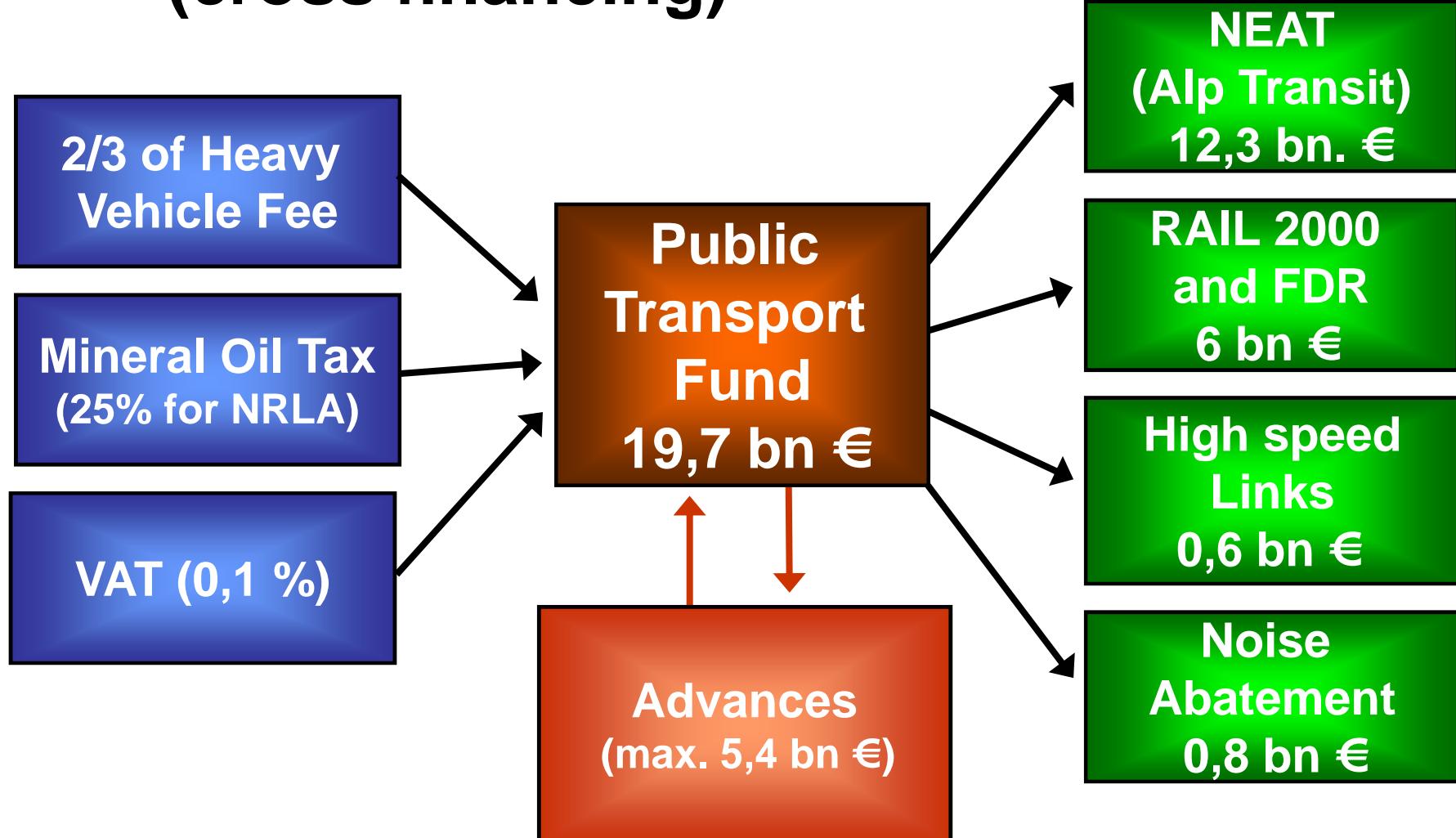


Vote on public transport funding



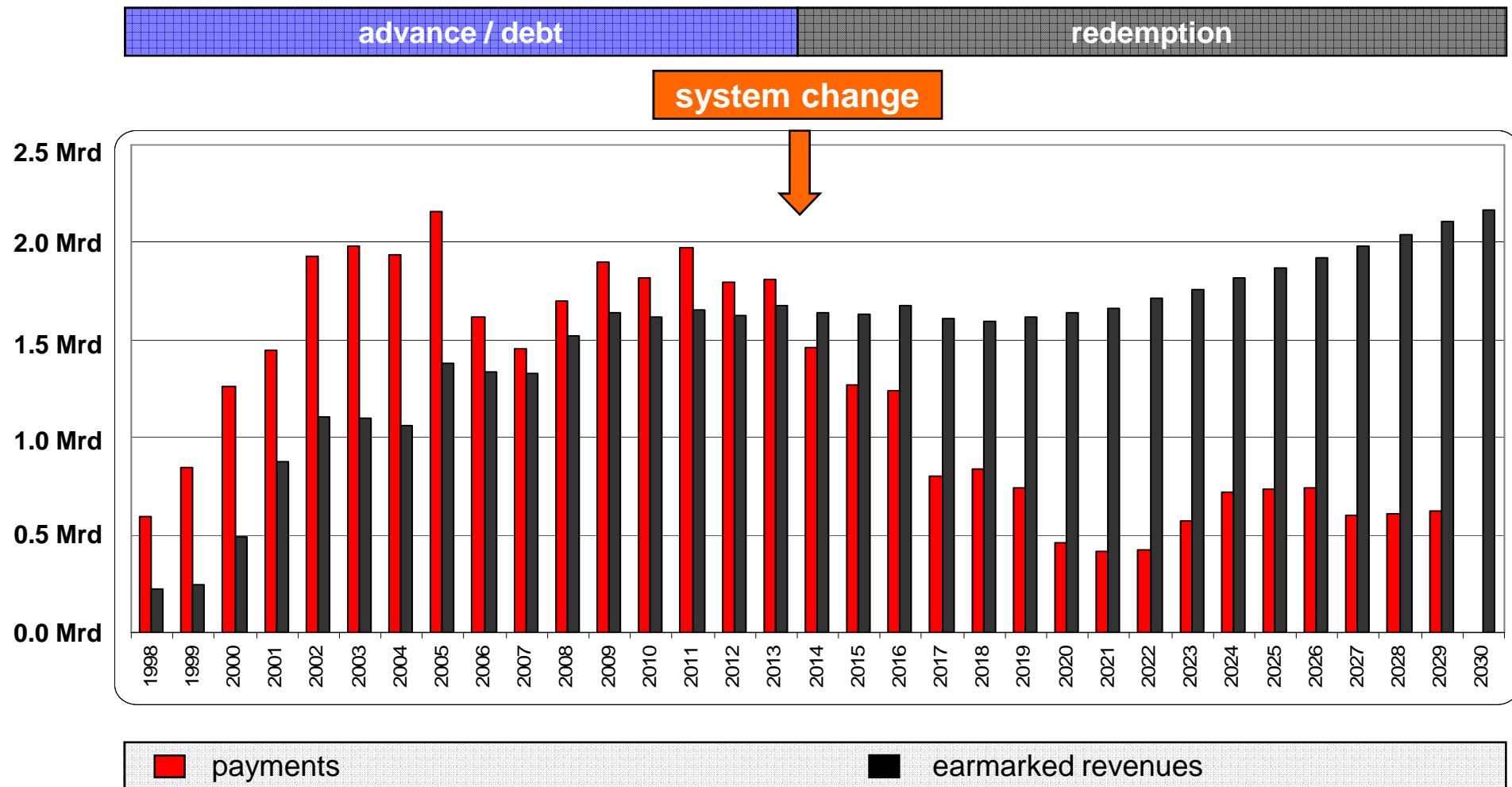


Public transport fund (cross financing)



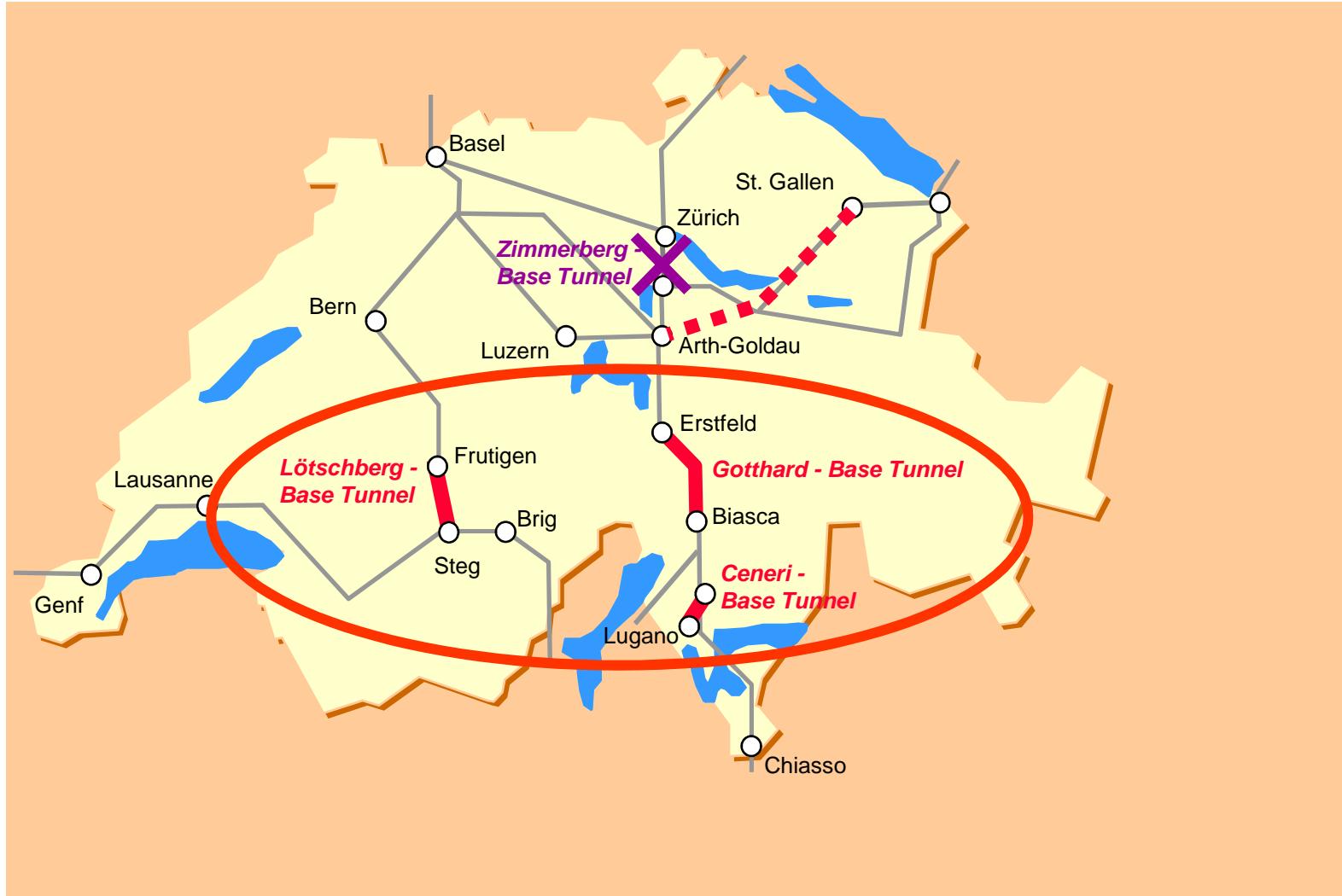


Public Transport Fund



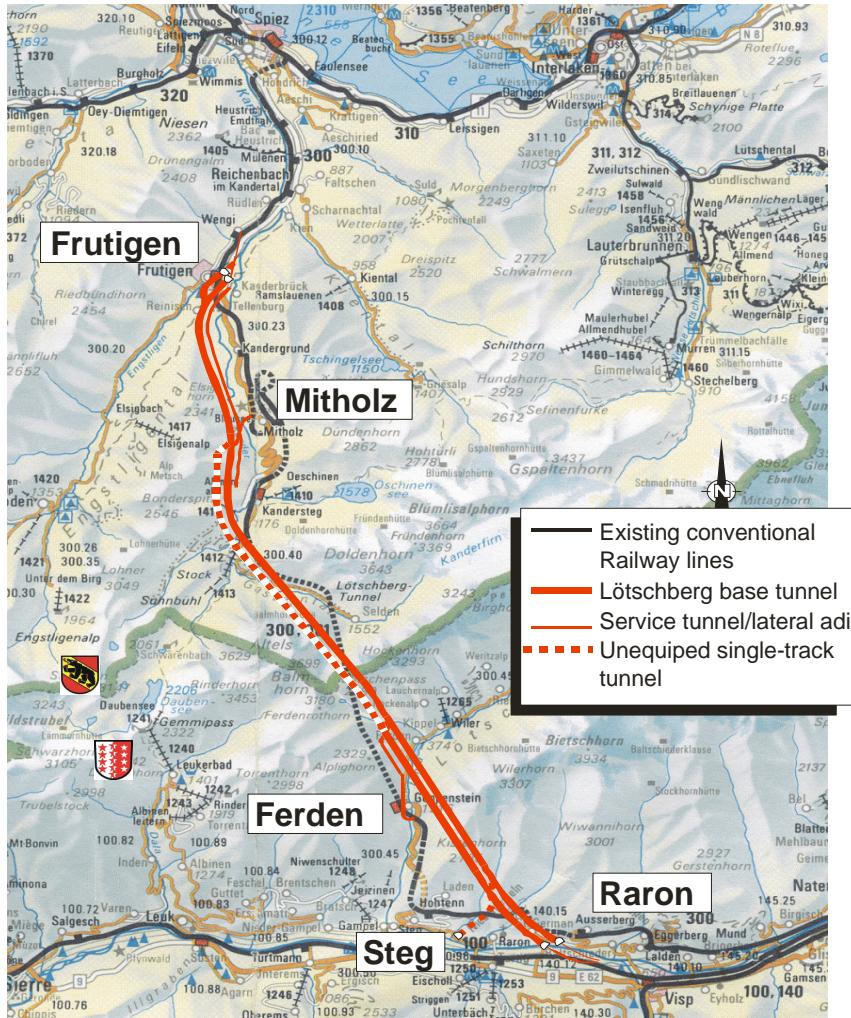


NRLA: The AlpTransit tunnels



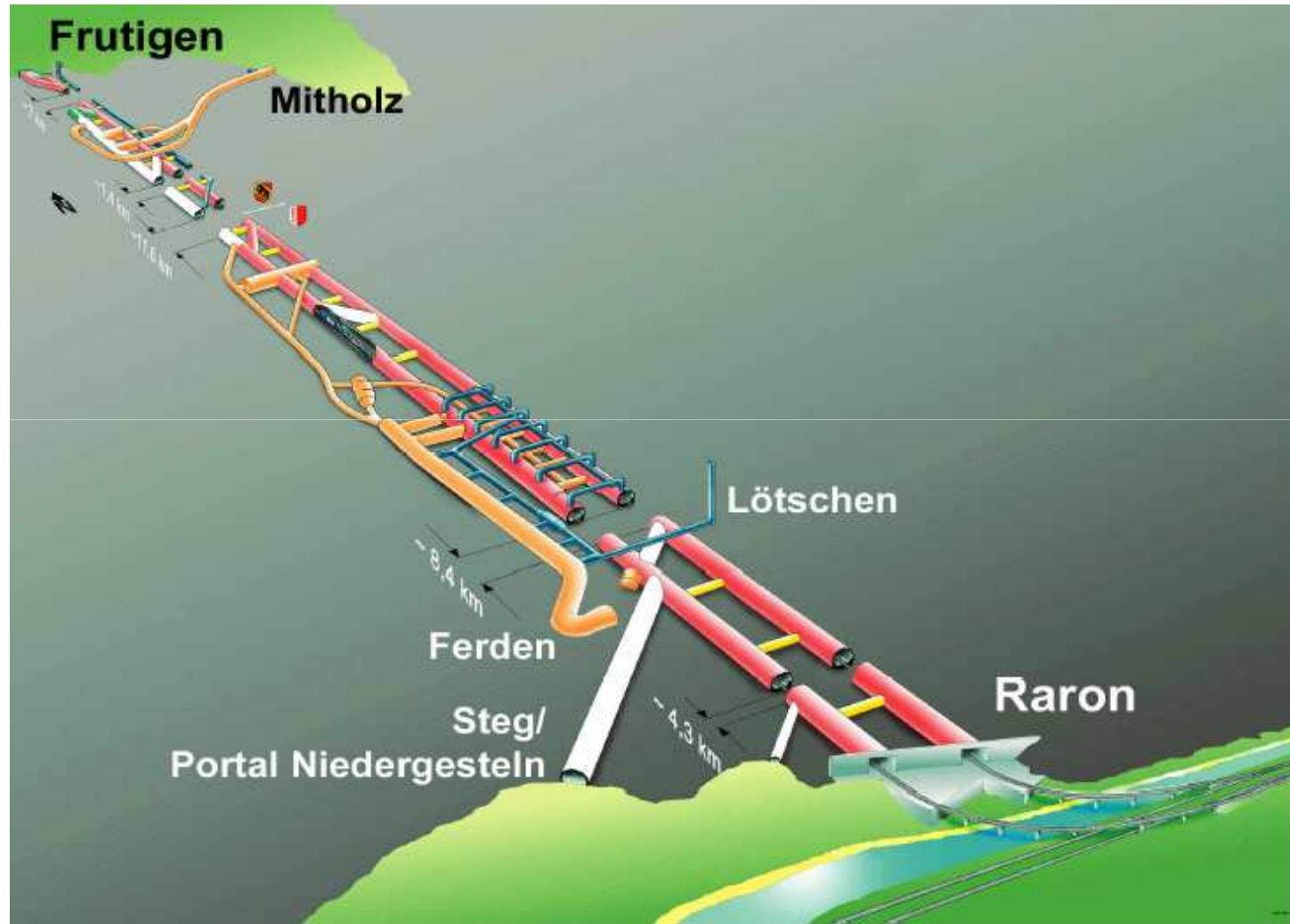


Overview Lötschberg base tunnel





Lötschberg tunnel system





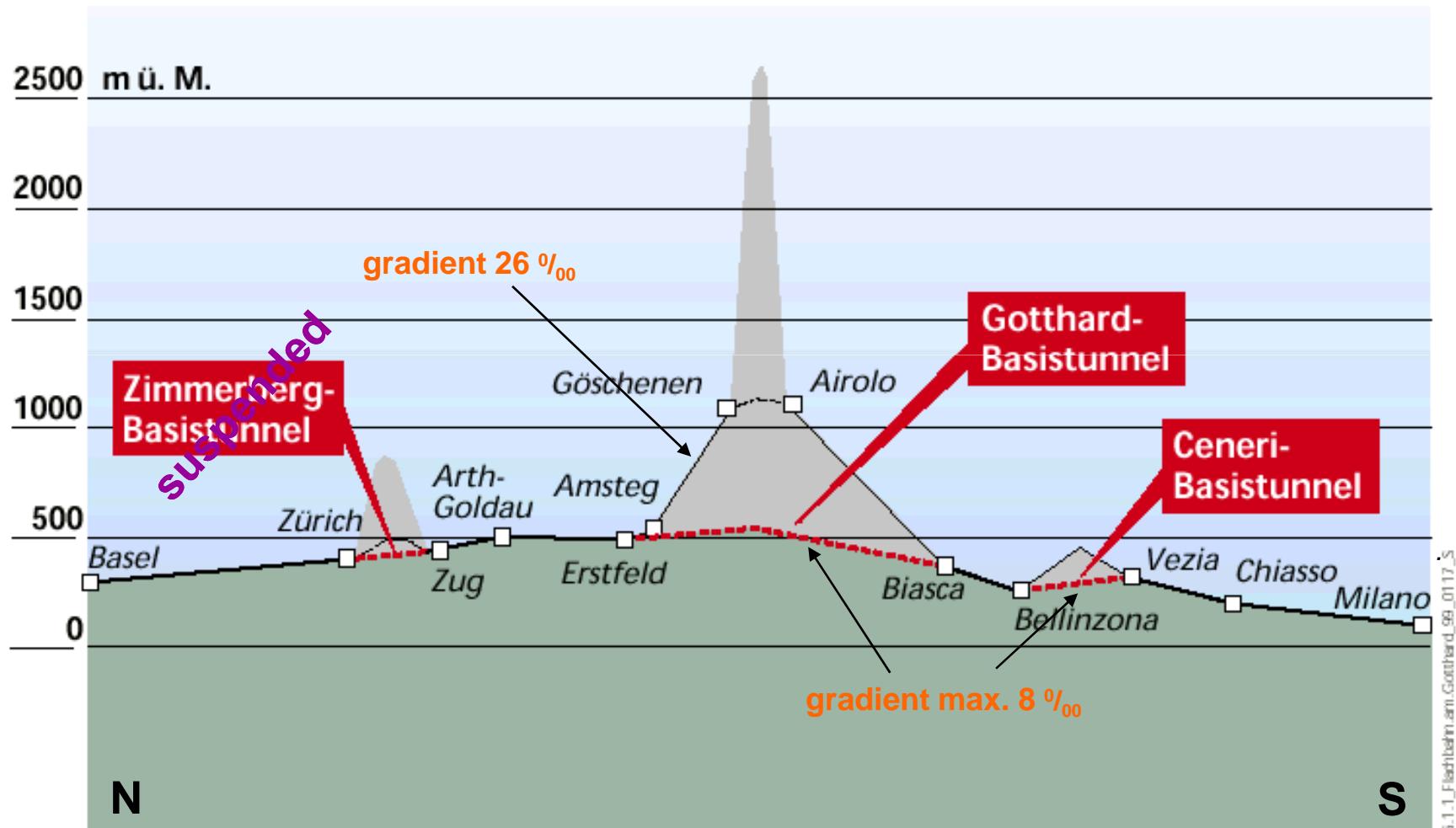
Lötschberg base tunnel

- Beginning of construction: 2000
- Opening: December 9, 2007
- Trustworthiness of tunnel installations > 99,8%
- Costs: 4,3 billion € (+ 0.6 billion price increase)



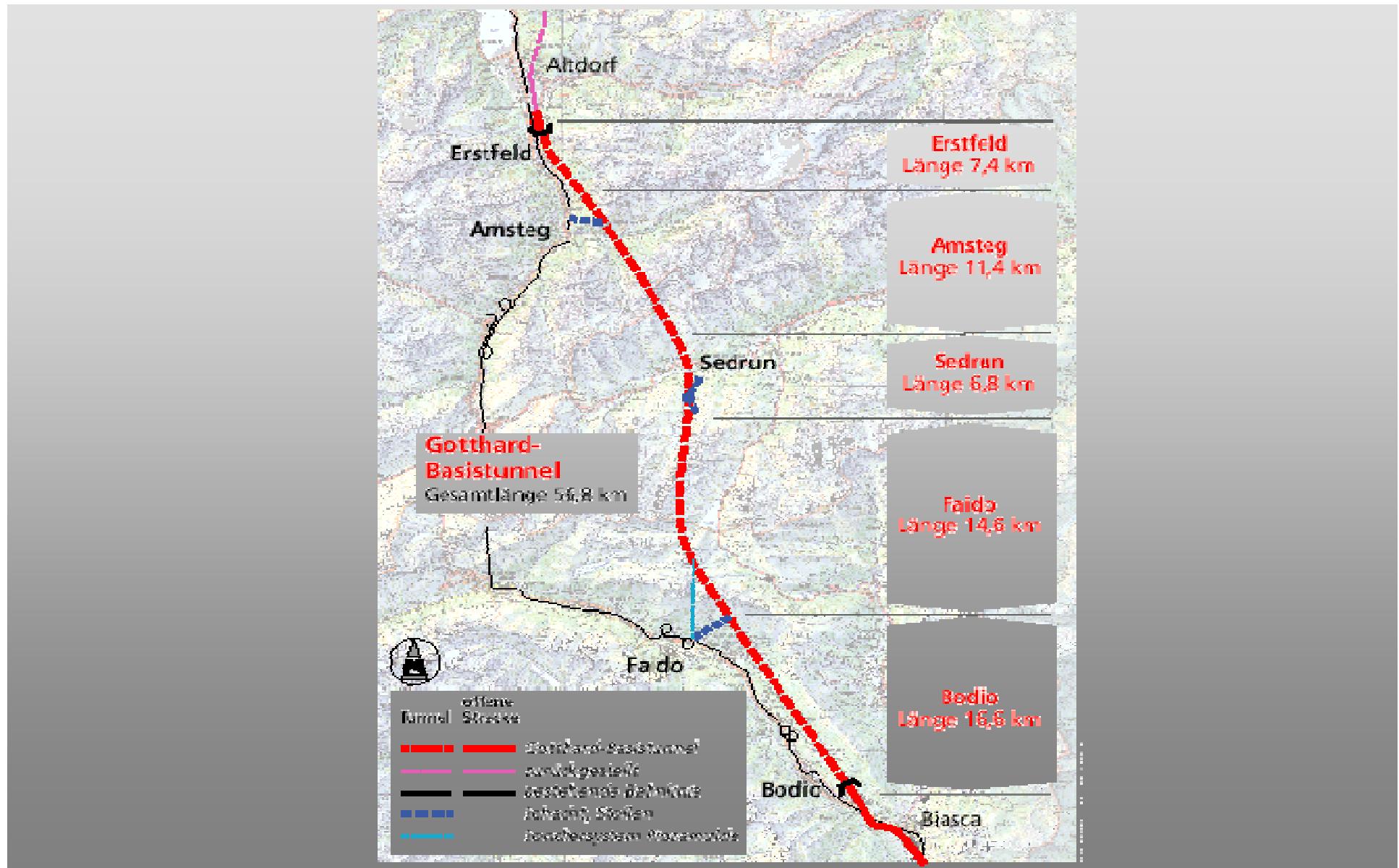


Profile of the Gotthard axis





Gotthard base tunnel





Gotthard base tunnel: features

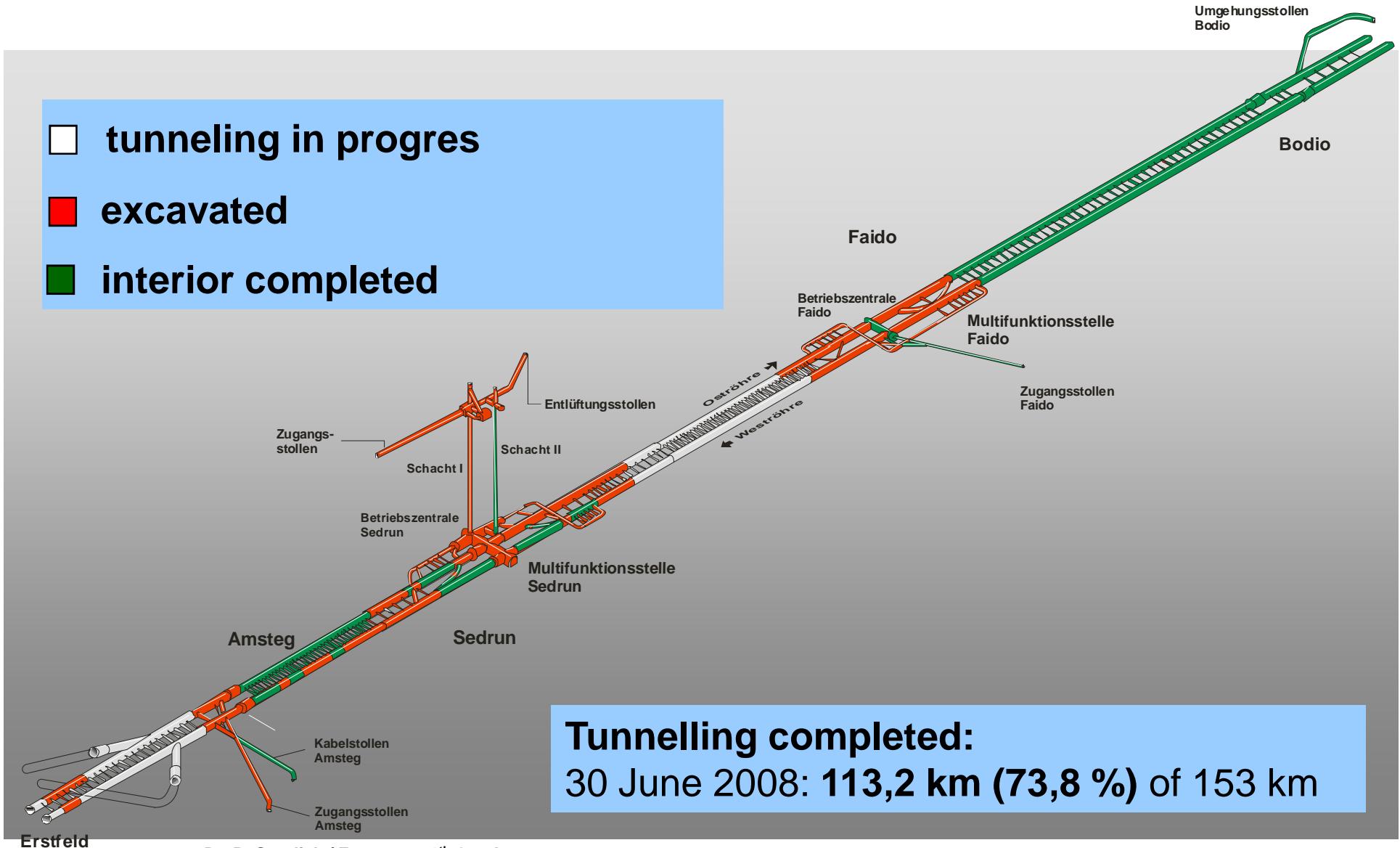
- Tunnel length: 57.0 km
- Two single track tubes
- Tunnel profile: EBV IV
- Connecting galleries all 300m
- Max. speed for passenger trains: 250 km/h
- Max. speed for freight trains: 160 km/h
- Culmination point: 550 m
- Maximum overlay: 2,300 m
- Cost of the Gotthard base tunnel:
approx. CHF 9,7 bn / € 6,0 bn (1998)





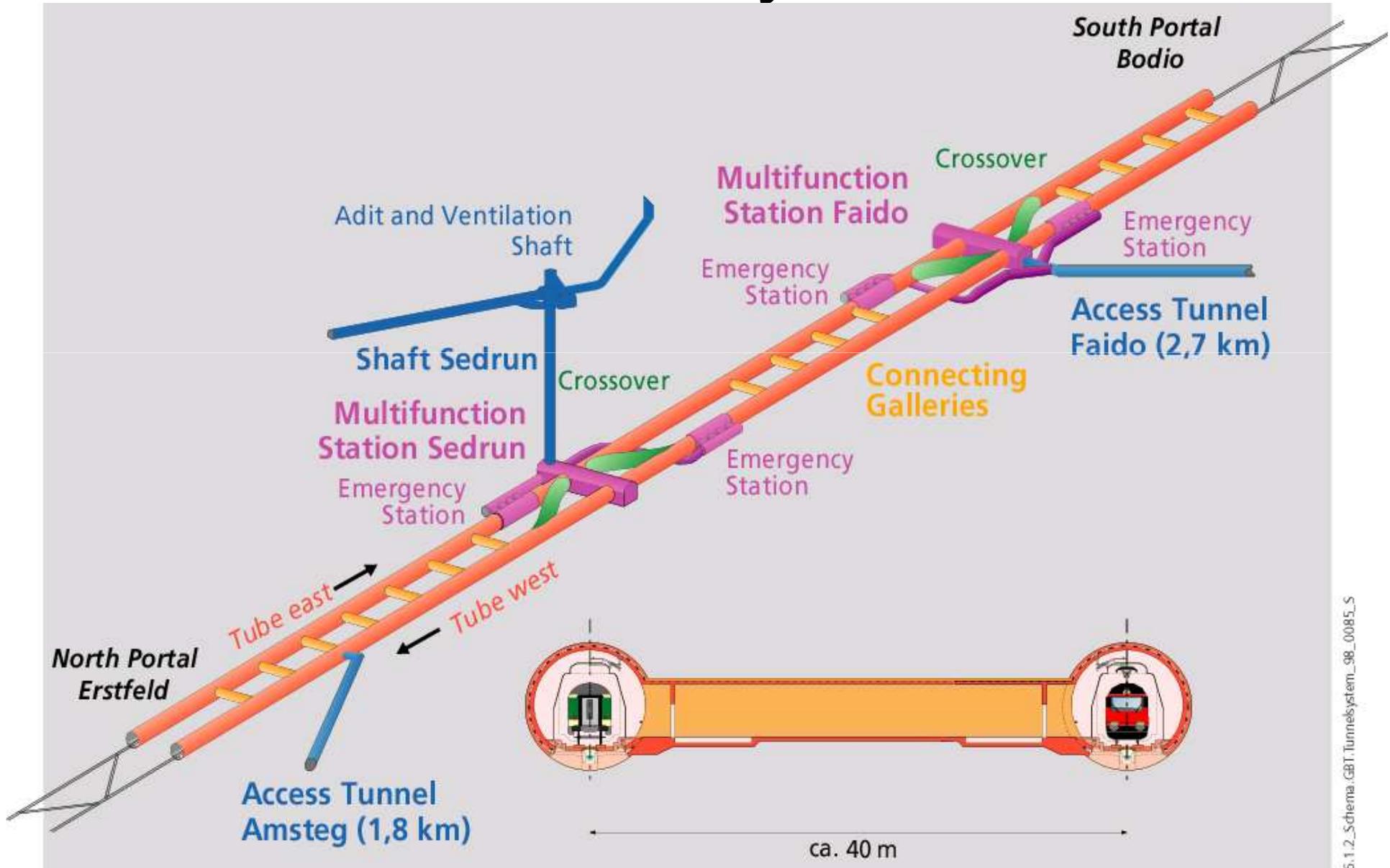
Gotthard base tunnel

- tunneling in progress
- excavated
- interior completed



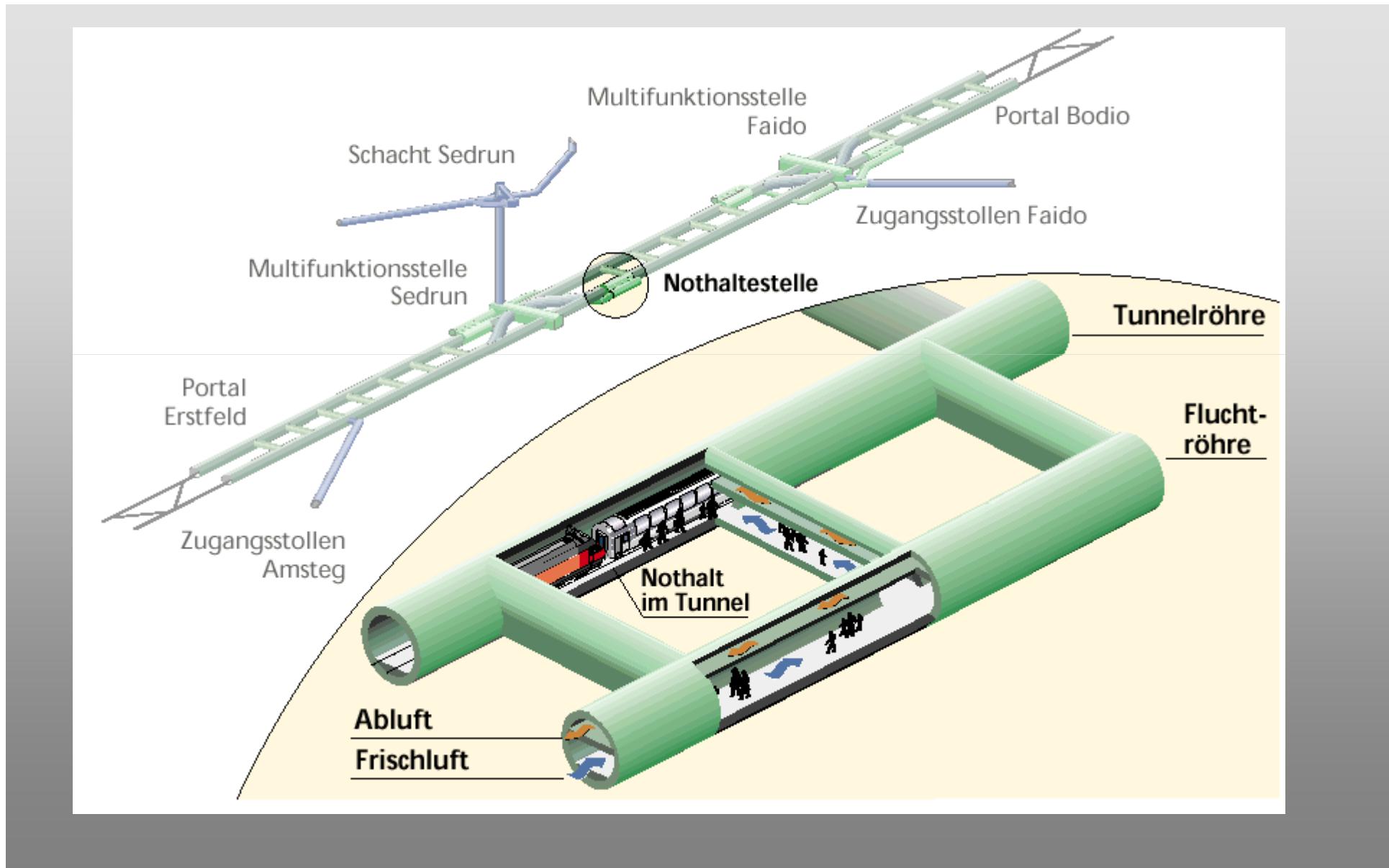


Gotthard base tunnel – scheme of tunnel system





Sedrun - emergency station





Sedrun - elevator



© AlpTransit Gotthard AG



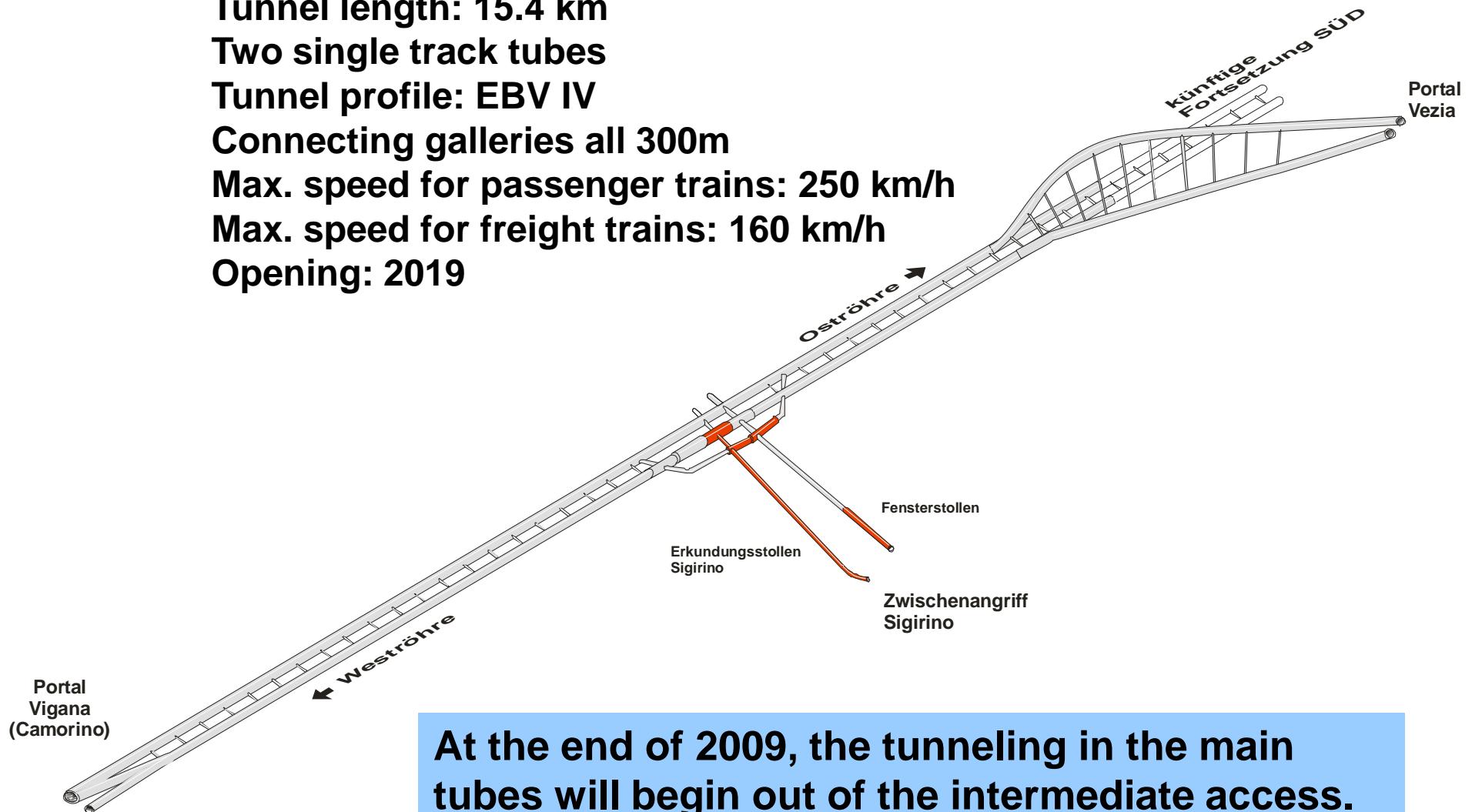
Bodio south portal: construction site





Ceneri Base Tunnel

Tunnel length: 15.4 km
Two single track tubes
Tunnel profile: EBV IV
Connecting galleries all 300m
Max. speed for passenger trains: 250 km/h
Max. speed for freight trains: 160 km/h
Opening: 2019



At the end of 2009, the tunneling in the main tubes will begin out of the intermediate access.



Geological challenges

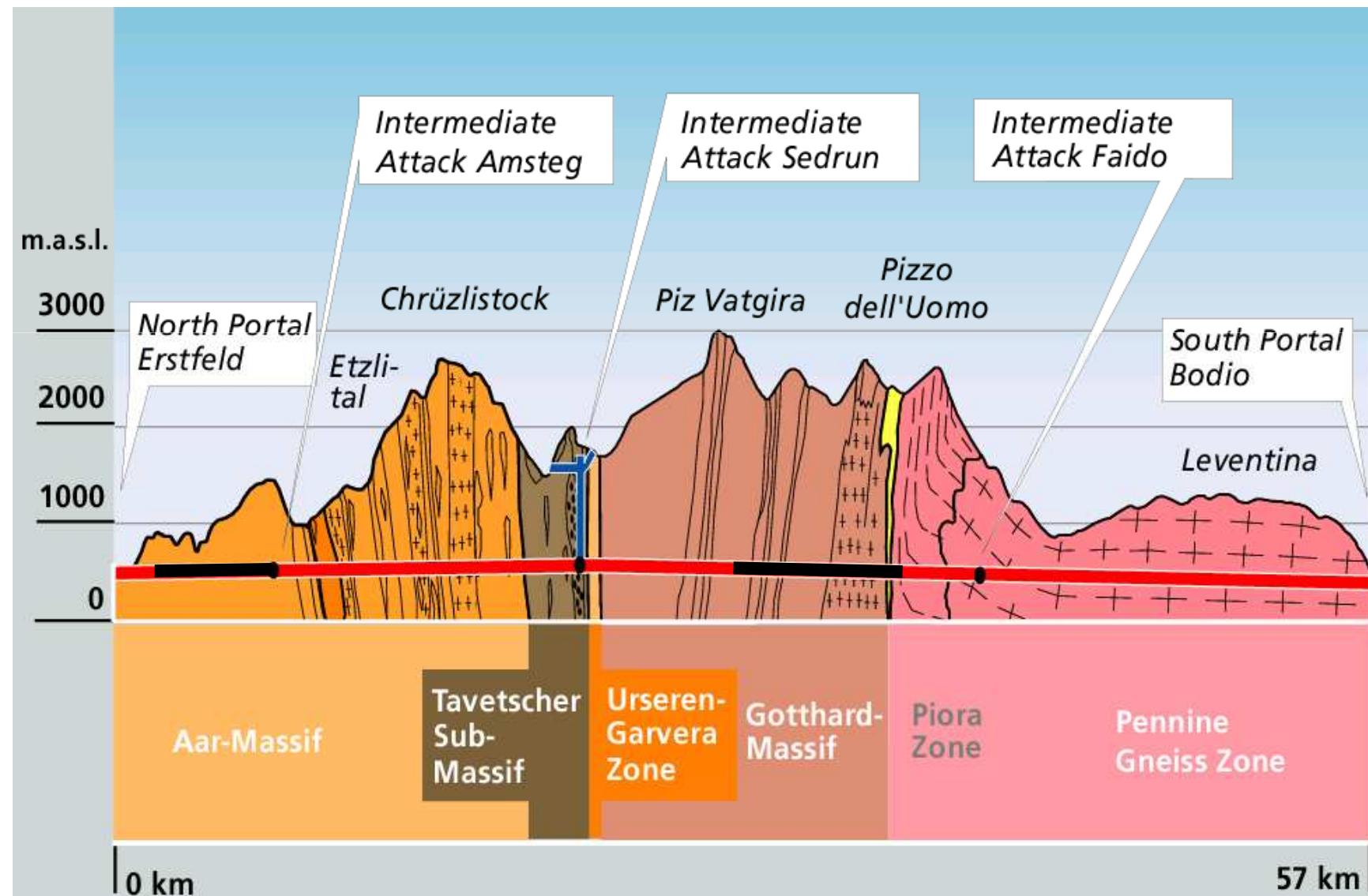


Deformation of steel arches at the tunnel base
in easily deformable rock formations and due to mountain
overlay of more than 2000m.



Gotthard base tunnel – geological section

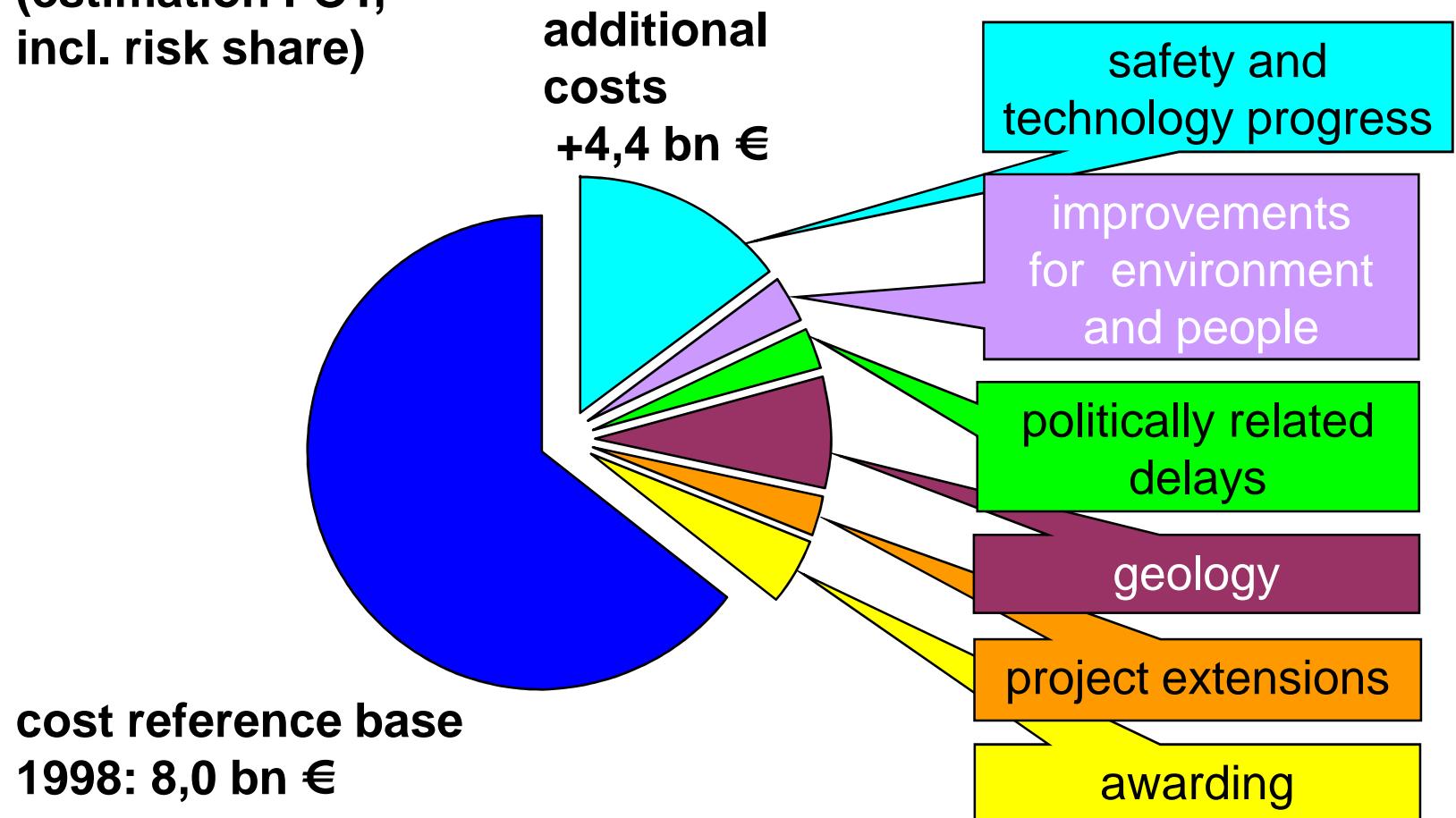
— not excavated





NEAT - additional costs (estimation)

final costs: 12,4 bn €
(estimation FOT,
incl. risk share)

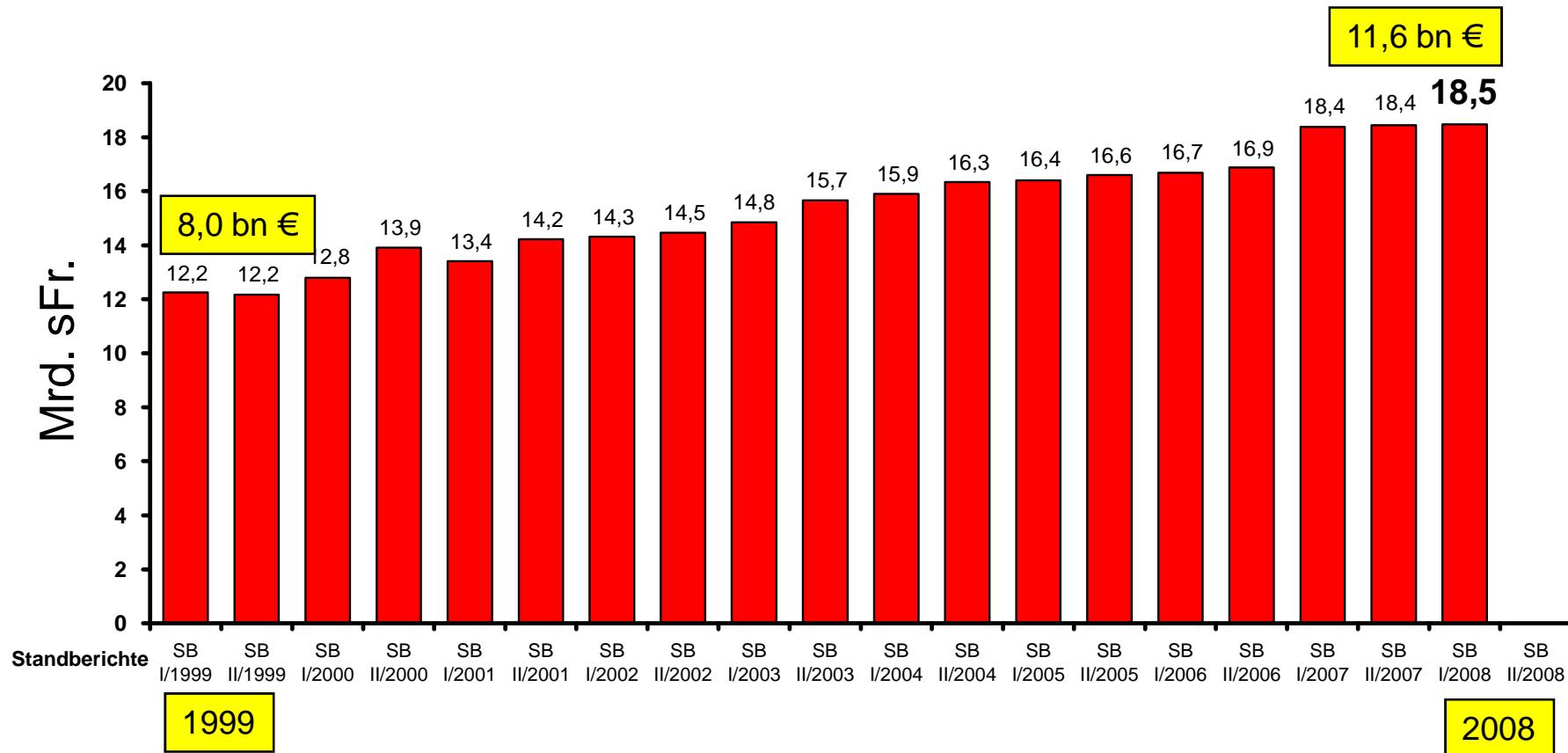


cost reference base
1998: 8,0 bn €



NEAT: Development of final costs

(price level 1998, without risk share)





Credit situation NEAT

In the first years, NEAT was knowingly underfinanced.

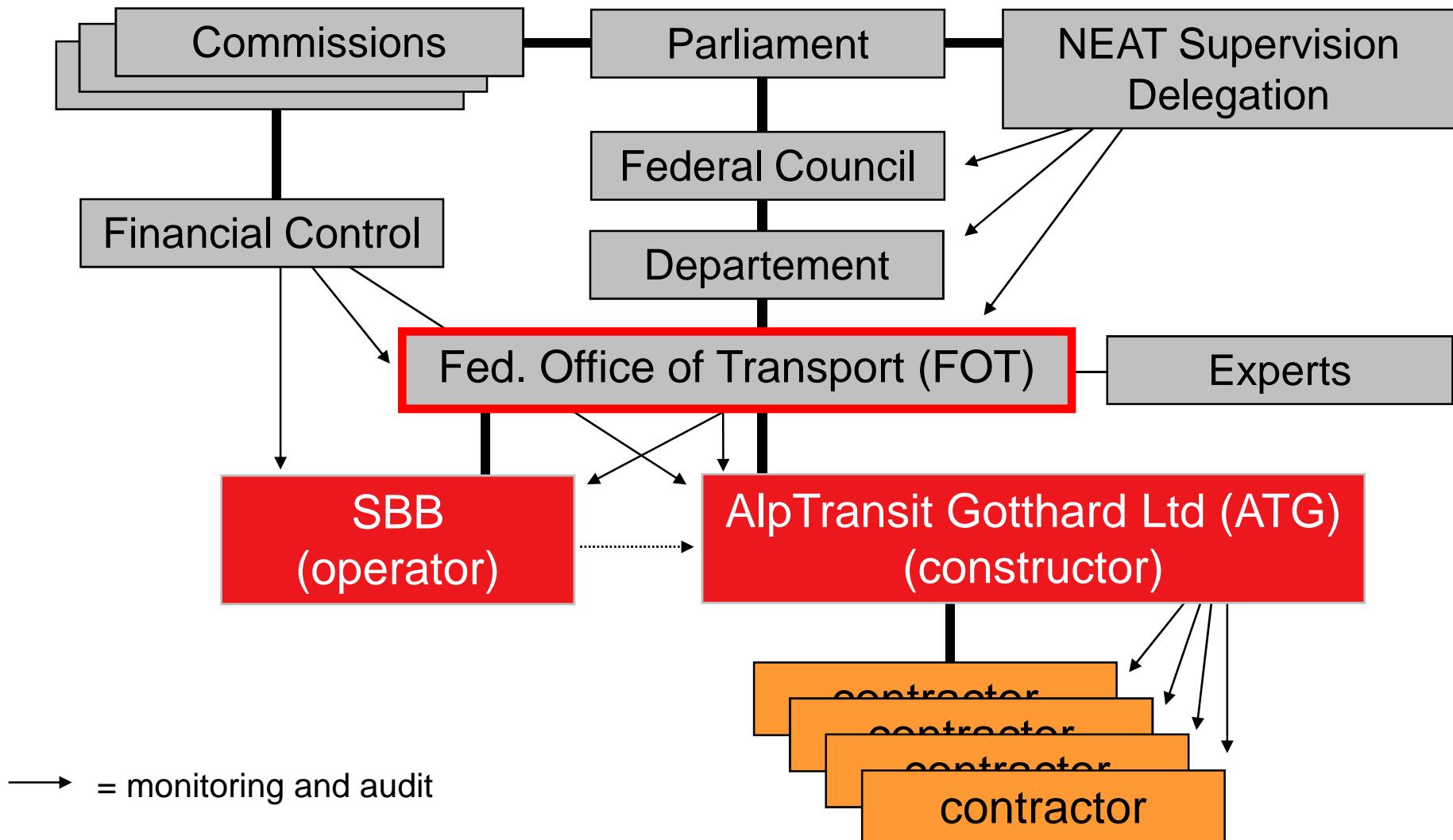
On 16.9.2008, Parliament authorized the new NEAT global credit.

- ! **For the first time in its history,
NEAT is fully financed
(12 billion €)**





Gotthard axis: Organisation





The operator is not the constructor

The organizational separation has

➤ **advantages:**

- 1) cost cutting through contradictory interests
constructor --> low investment costs
operator --> high investment costs
(lower costs for renewal and maintenance)
- 2) In case of problems, the authority can take a decision.

➤ **inconveniences:**

- 1) supplementary interfaces
- 2) risk that project elements are „forgotten“

Important:

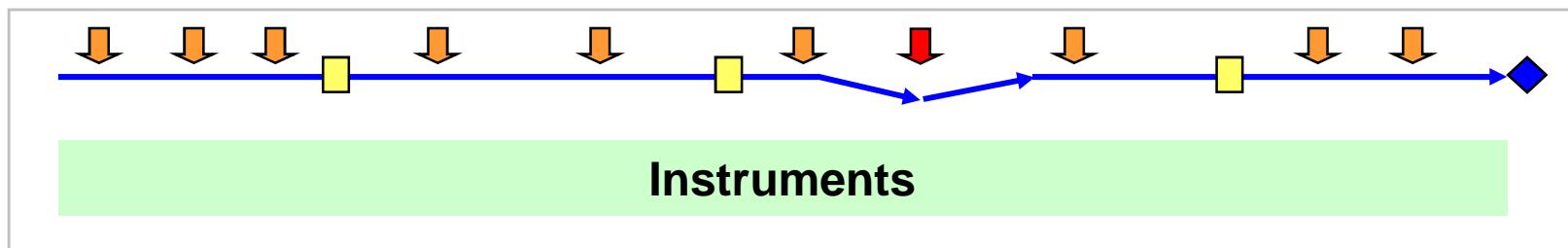
Strong and „in time“ collaboration between constructor and operator



Principles of project management

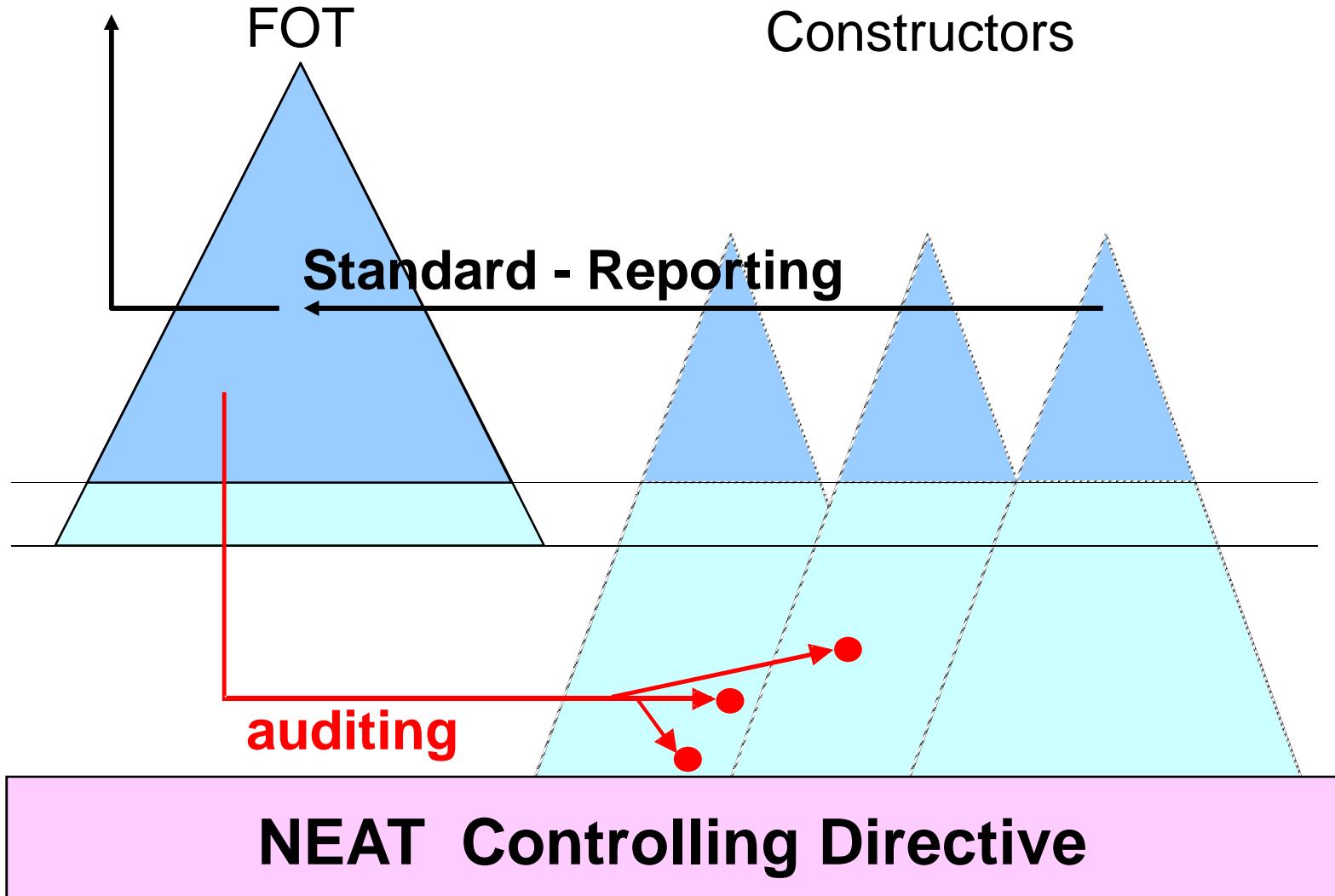
Management requires:

- **Objective** ⇒ agreement on project requirements ◆
- **Procedure** ⇒ referential bases □
- **Control** ⇒ periodical comparisons between reality and forecasts
 ↓
- **Instruments** ⇒ modification reports, risk management,
 reports, controls, etc.





Levels of project supervision





Conclusion

- Ensured financing = determining factor
- Organization model operator < > constructor
- Supervision functions require clear repartition of roles
- Establishing good control system
- Foreseeing costs for adaptation to technological progress





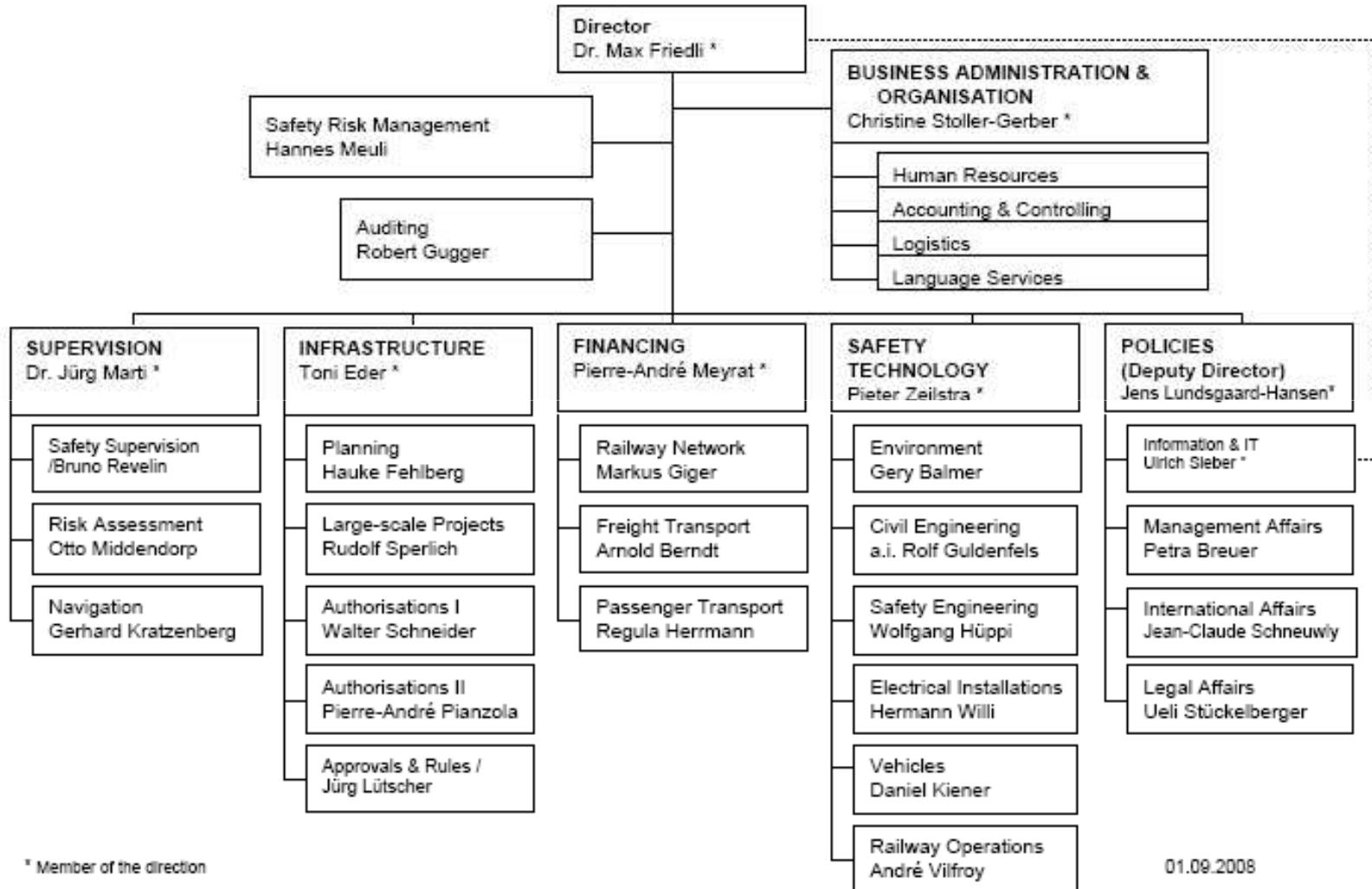
The Alps - not only an obstacle!







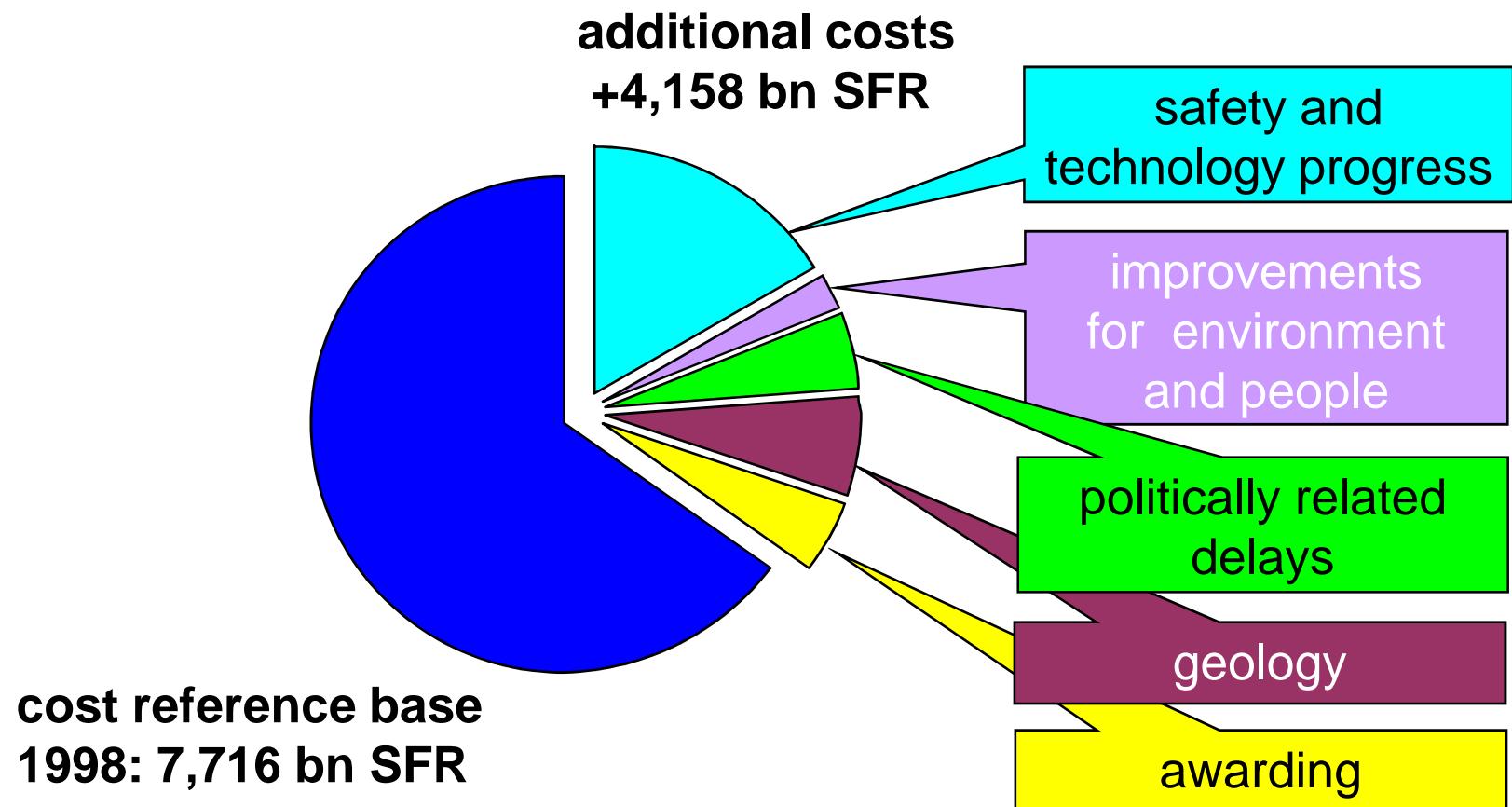
Organisation: Fed. Office of Transport





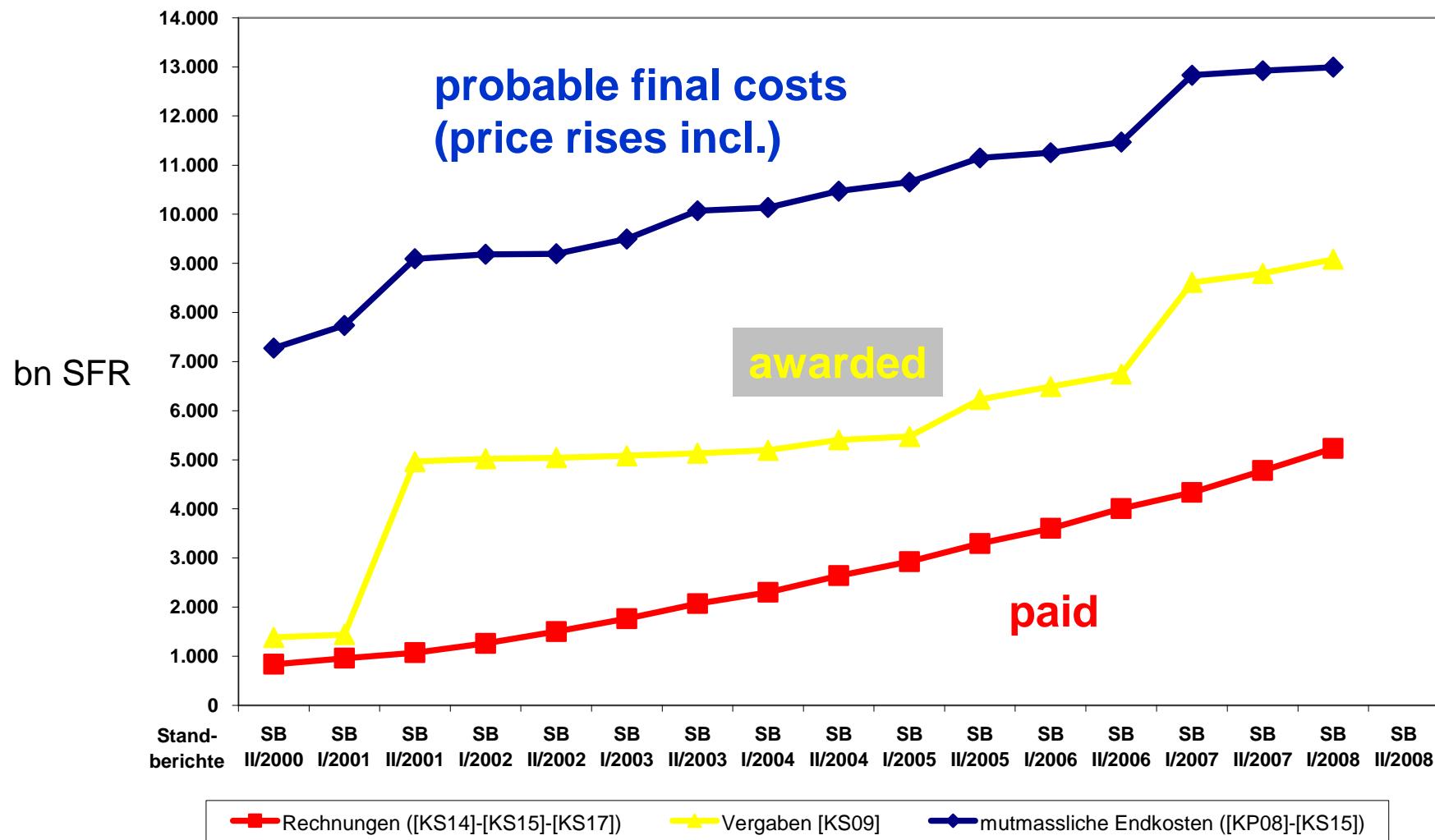
Gotthard axis: additional costs

final costs: 11,874 bn SFR
(estimation ATG)



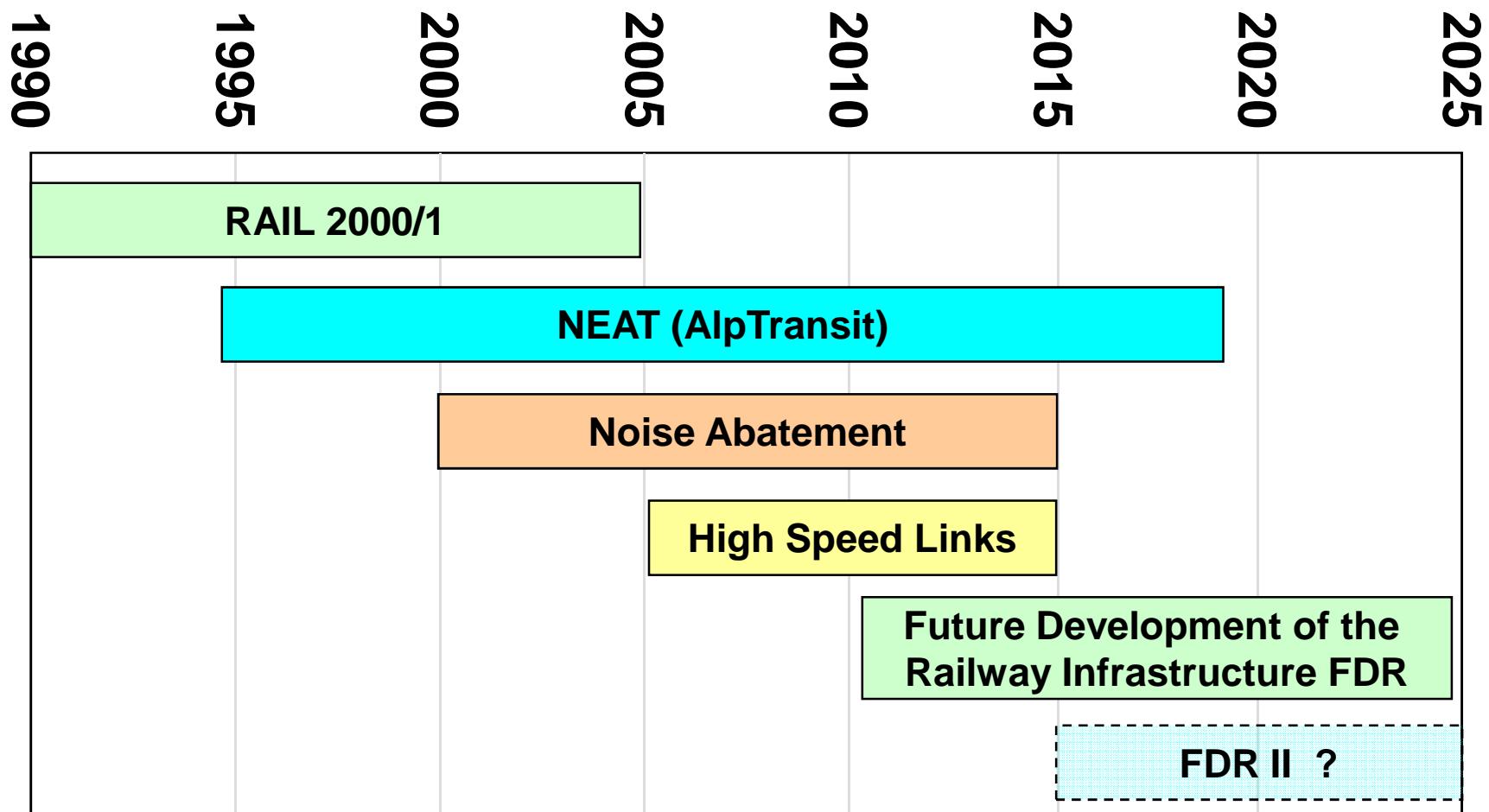


Cost development of Gotthard axis



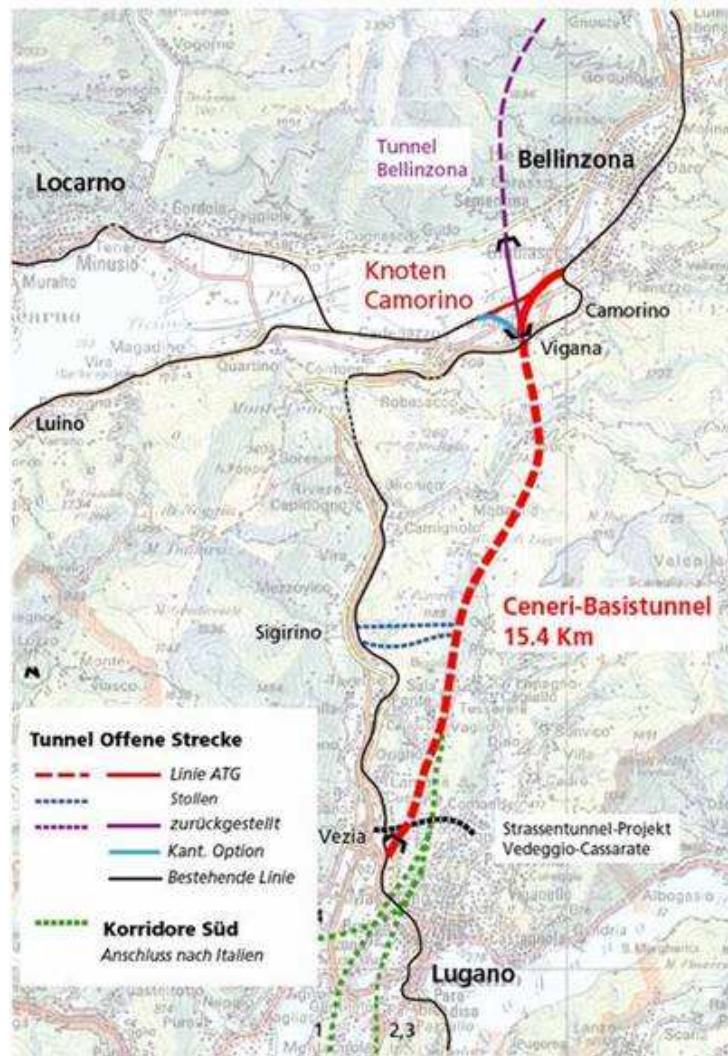


Time frame





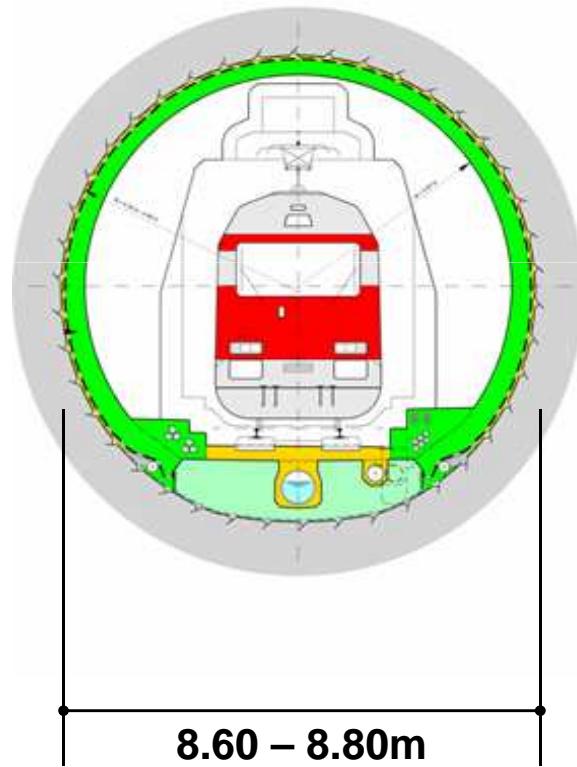
Ceneri base tunnel



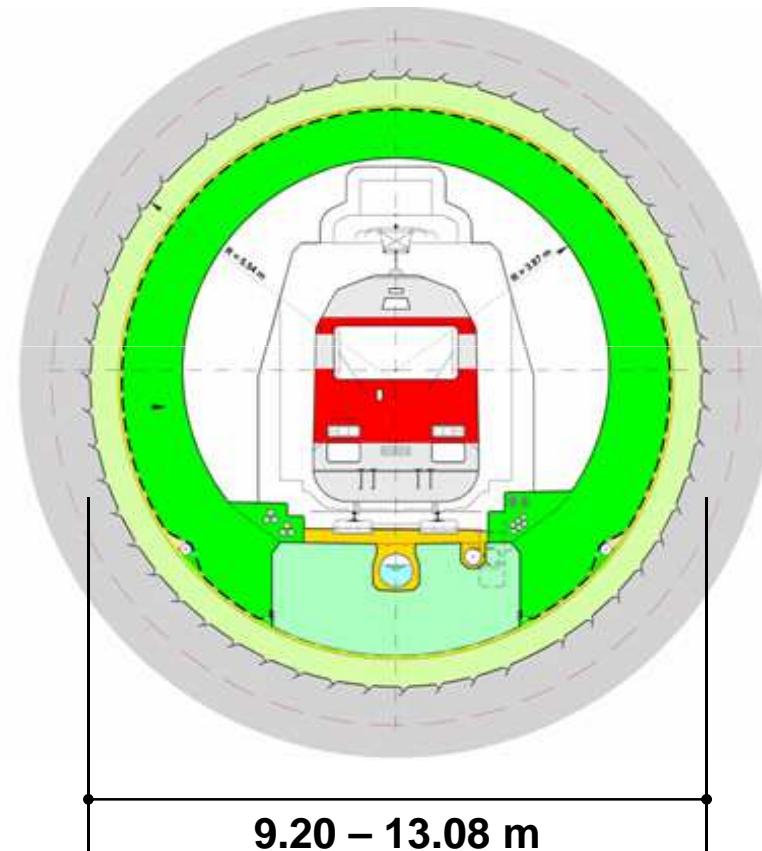


Gotthard base tunnel: bore width

solid rock



pressing rock





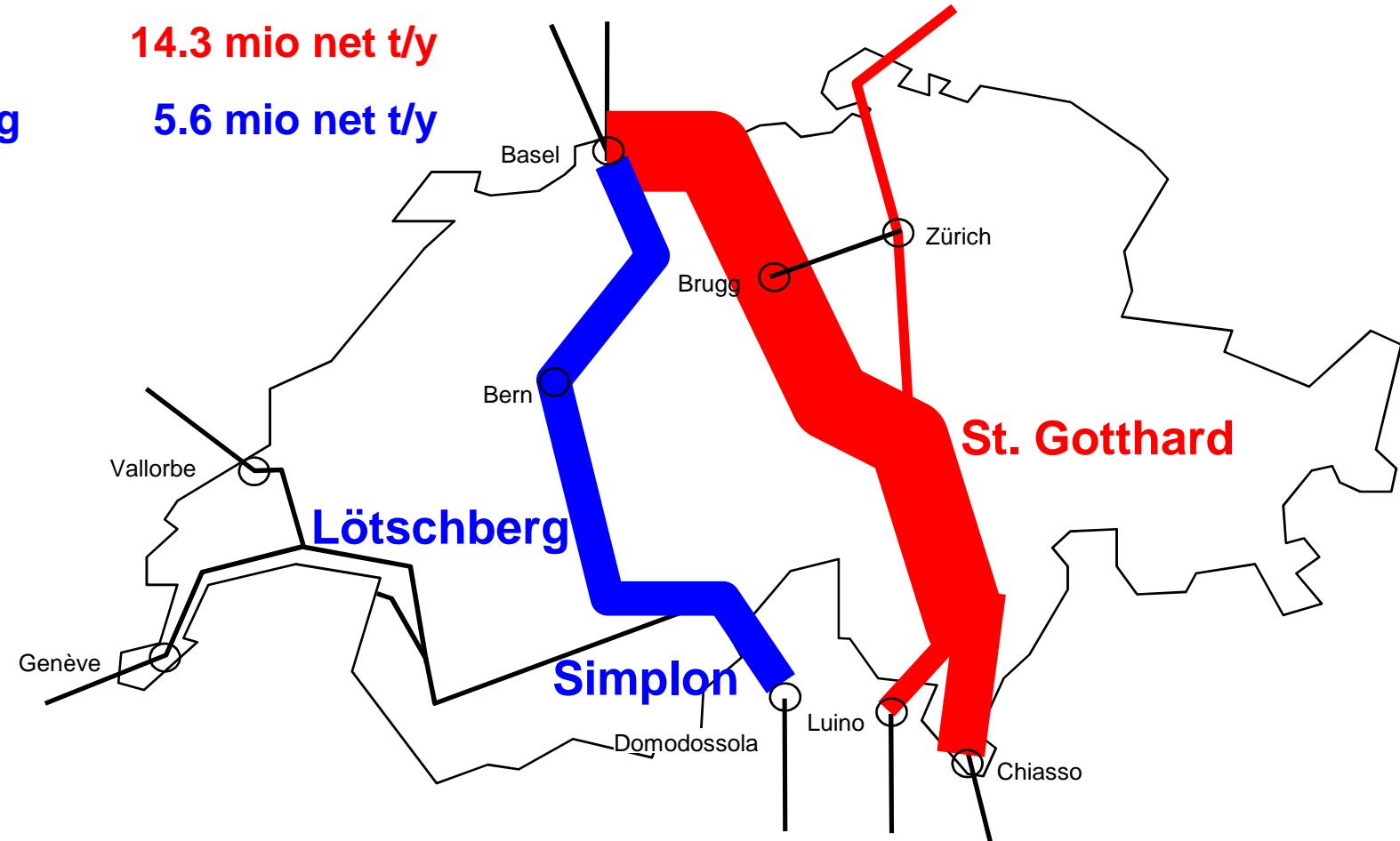
Railway traffic across the Alps

Gotthard

14.3 mio net t/y

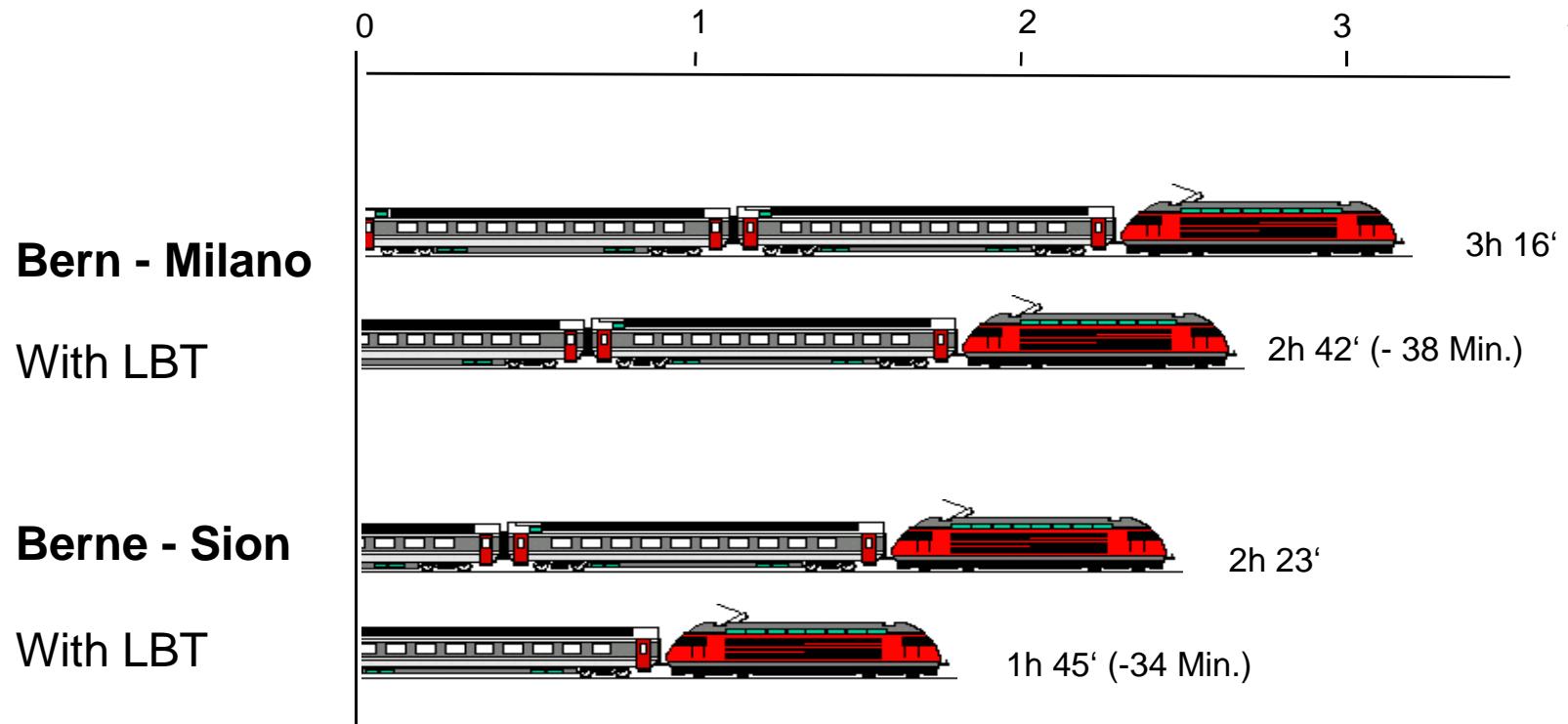
Lötschberg

5.6 mio net t/y



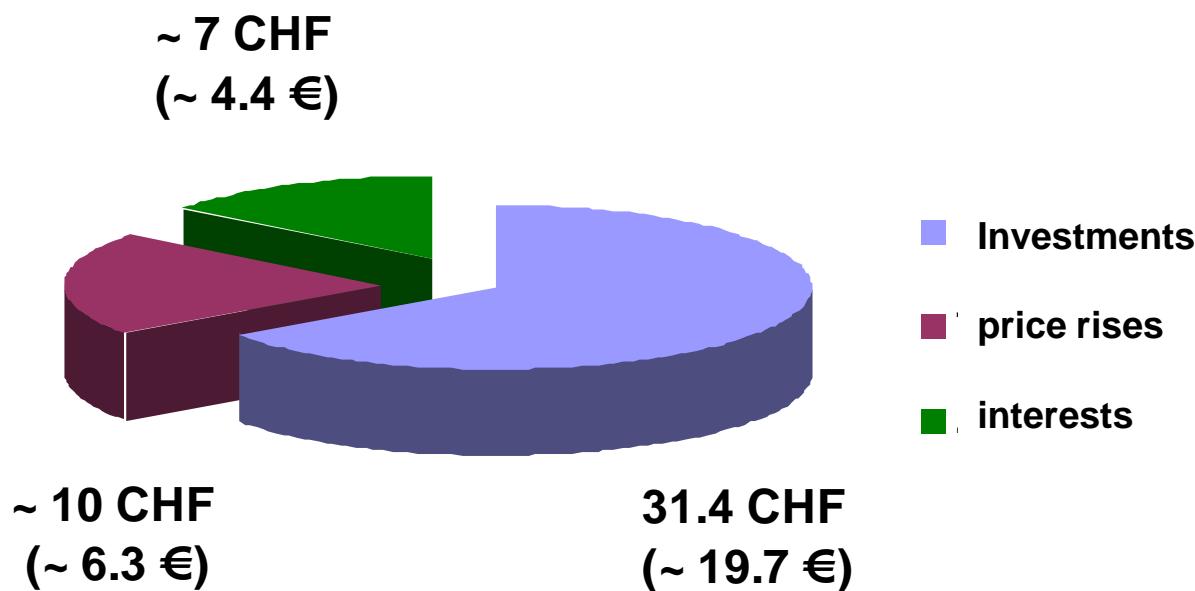


Lötschberg axis: travel times





Public Transport Fund: estimate of expenses





Financing (1)



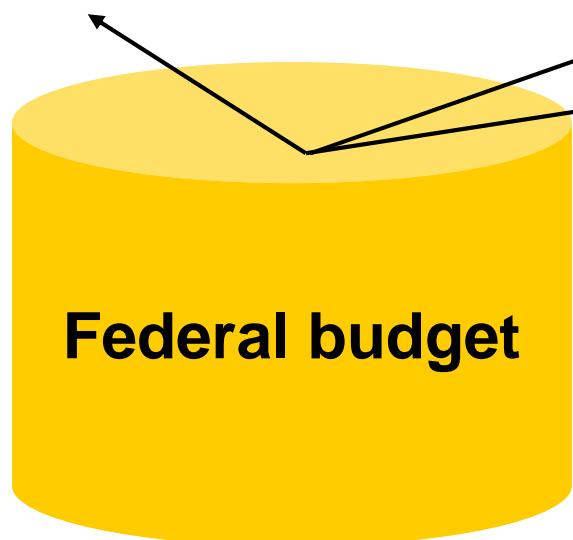
Infrastructure



Regional transport



Freight transport



Aim:
Maintain performance



Financing (2)



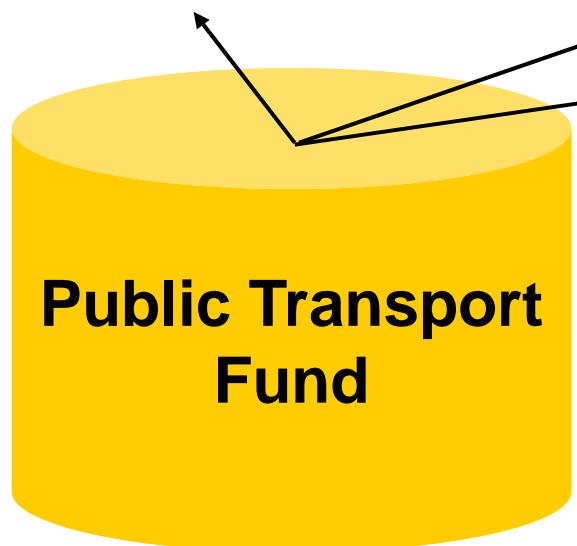
Lötschberg



Gotthard



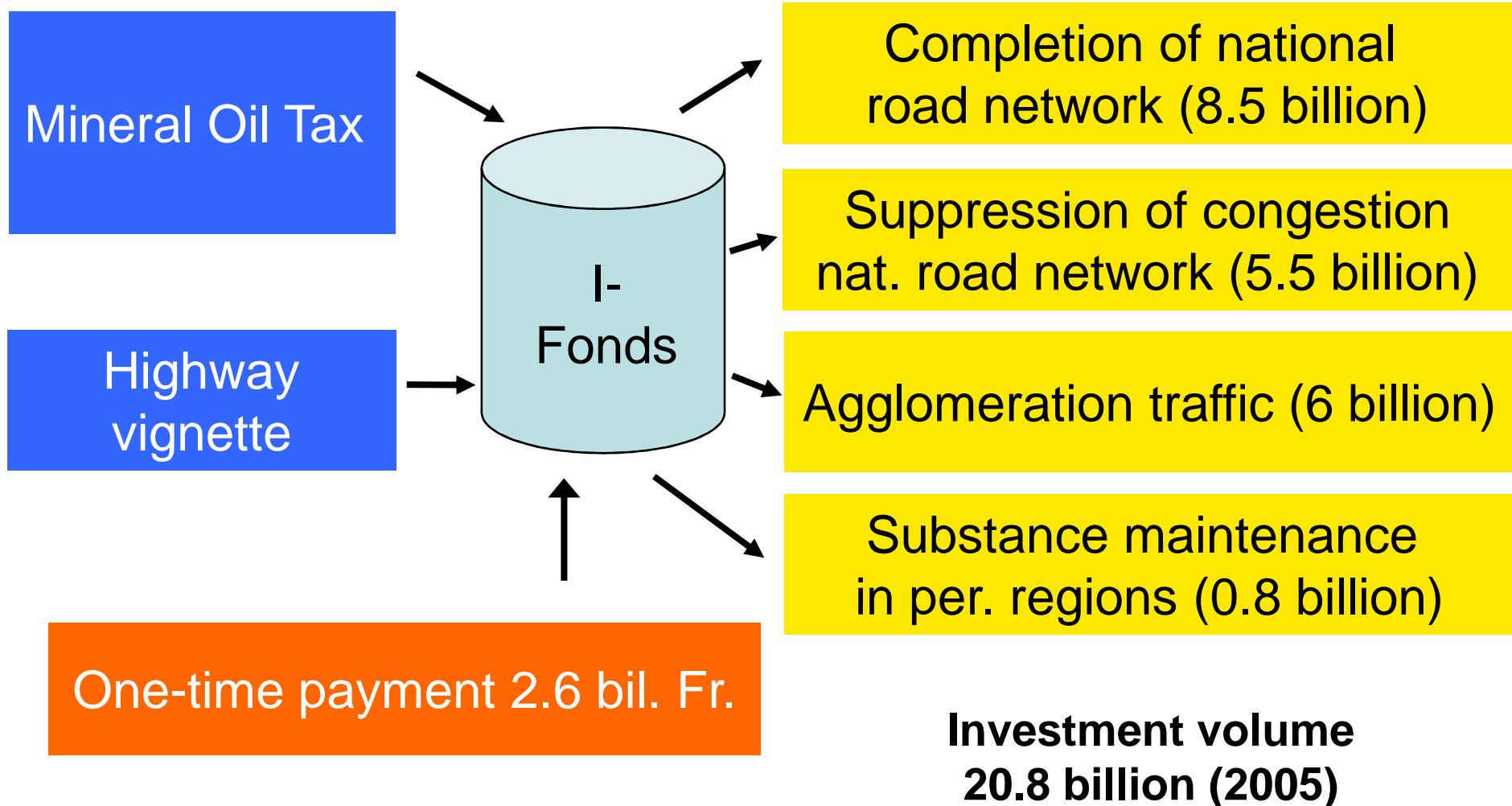
Mattstetten-Rothrist



**Aim:
Improve performance**



Infrastructure fund: financing



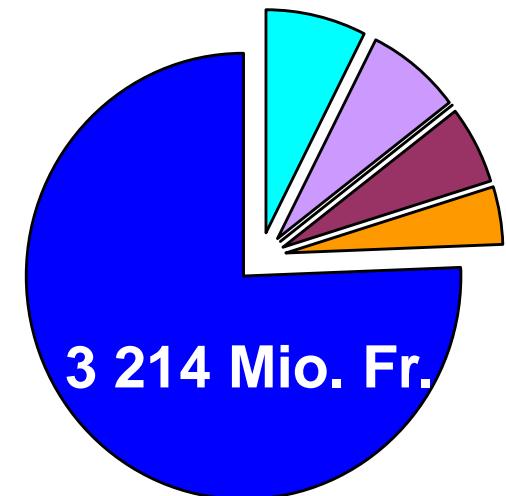


Modifications Lötschberg axis

- Sicherheit und Stand der Technik (321 Mio.)
- Verbesserungen für Bevölkerung und Umwelt (292 Mio.)
- Politisch begründete Verzögerungen (- Mio.)
- Geologie (244 Mio.)
- Vergabe und Bauausführung (182 Mio.)
- Ursprüngliche Kostenbezugsbasis (3 214 Mio.)

Alle Zahlenangaben in Millionen Franken gerundet; Preisstand 1998

Mehrkosten Achse
Lötschberg:
+1 039 Mio. Fr.

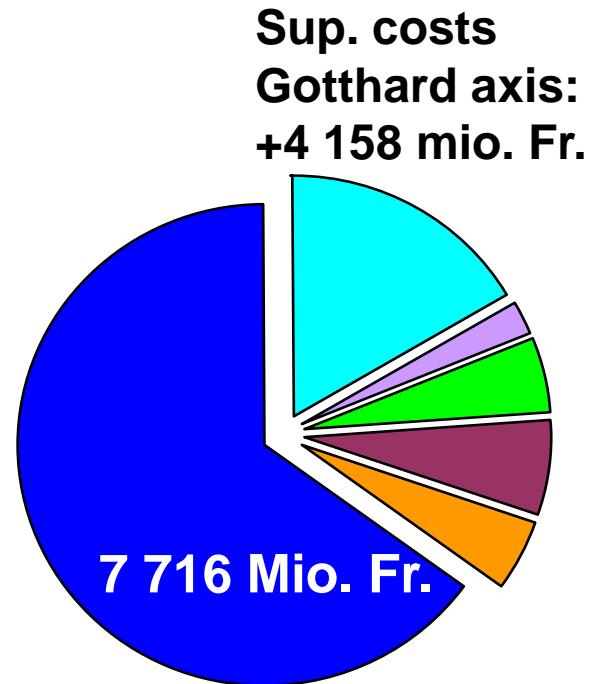


Mutmassliche
Endkosten:
4 253 Mio. Fr.



Modifications Gotthard axis

- Sicherheit und Stand der Technik (1 974 Mio.)
- Verbesserungen für Bevölkerung und Umwelt (259 Mio.)
- Politisch begründete Verzögerungen (595 Mio.)
- Geologie (780 Mio.)
- Vergabe und Bauausführung (550 Mio.)
- Ursprüngliche Kostenbezugsbasis (7 716 Mio.)



All cost data are rounded in million francs, prices of 1998

Probable end costs: 11 874
mio. Fr.